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# AUTOMOBILE

Vol. XXXV  
No. 5

NEW YORK, AUGUST 3, 1916

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CHAMPION

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7/8-18 9/16 Price \$1.00

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Most good cars are now equipped with the Stewart Tire Pump before they leave the factory.

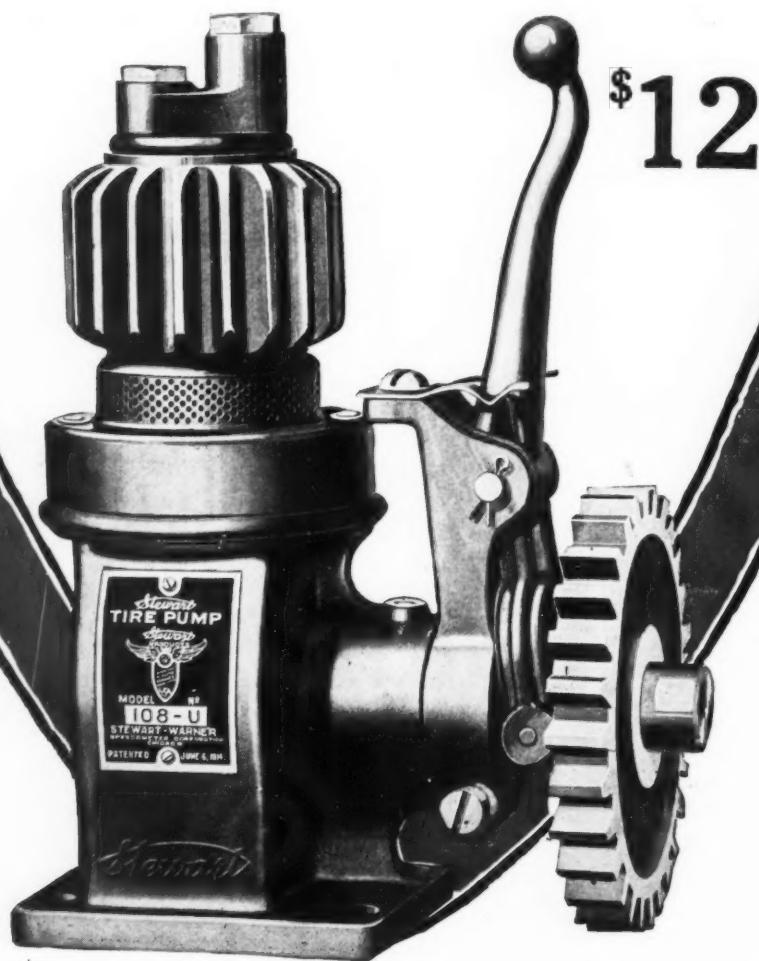
It's only a matter of time before all good cars will be.

A pump is more necessary and a greater advantage than any other accessory.

The Stewart Tire Pump is the best—and the most inexpensive.

*"No car is better than its accessories"*

The Stewart-Warner Speedometer Corporation  
Chicago, Ill., U. S. A.





# The AUTOMOBILE

VOL. XXXV

NEW YORK—THURSDAY, AUGUST 3, 1916—CHICAGO

No. 5

## G. M. C.—121,113 Cars in 11 Months

Earns \$144,000,000 or \$50,000,000 More than in All 1915

	1916	1915
Earnings, 11 months	\$144,000,000	\$86,000,000
Automobiles, 11 mos.	121,113	68,604

DETROIT, MICH., Aug. 1—Gross sales of the General Motors Co. for the first 11 months of its fiscal year, or to June 30, were \$144,000,000. This is over \$58,000,000 more than the sales for the same 11 months of the 1915 fiscal year. This total of gross sales is nearly \$50,000,000 more than the total sales for the entire fiscal year of 1915.

In the 11 months ending June 30 there were 121,113 automobiles produced by the organization as compared with 68,604 in the corresponding months of the previous year. In the first 11 months of this year the company has produced 43,045 cars more than in all of 1915.

President W. C. Durant states that the undivided profits applicable to common stock amounted to approximately \$24,500,000 on June 30 this year instead of \$11,686,280 for the similar period of 1915. On June 30 General Motors had approximately \$25,700,000 in cash in banks and in sight drafts with documents attached. July is expected to show very satisfactory results, although in some of the plants of the company there might have been a slight decrease in production on account of inventories

(Continued on page 208)

### Friend Is United Motors V.-P.

RACINE, WIS., Aug. 1—Otis C. Friend has resigned as sales manager of the Mitchell-Lewis Motor Co. to become vice-president and general manager of the United Motors Co. He commences his new duties in the New York City offices of the United Motors Co. the middle of

August. Mr. Friend has been connected with the automobile industry for nearly a score of years, beginning with the Chicago sales of the Locomobile. He joined the sales force of the Chicago Mitchell agency in 1900, and later handled Mitchells as the firm of Brown & Friend in Milwaukee.

Mr. Friend then became purchasing agent of the Mitchell-Lewis factory here and was successively assistant to J. W. Bate and general superintendent of shops. Later he became assistant factory manager, assistant sales manager and advertising manager. His successor at the Mitchell factory has not yet been appointed.

### Coffin Goes to Europe

NEW YORK CITY, Aug. 2—Howard E. Coffin, consulting engineer of the Hudson Motor Car Co., sails for Europe next week on the Philadelphia to spend a month in England and France investigating industrial and transportation conditions in these countries. Mr. Coffin is a member of the U. S. Naval Consulting Board and has taken a very active interest in motor transport as connected with the government during the present year.

### Dort Raises Price to \$695

FLINT, MICH., Aug. 2—The Dort Motor Car Co., this city, has raised the price of its touring car from \$665 to \$695, beginning Aug. 1.

### Stewart Warner Buys V-Ray

CHICAGO, ILL., July 31—The Stewart-Warner Speedometer Corp. has purchased the V-Ray Spark Plug Co., of Marshalltown, Iowa, and will begin the manufacture of V-Ray plugs in the new addition to the Chicago plant of the Stewart company. Production will be increased to several thousand a day. V. S. Hanson, president of the V-Ray company, becomes manager of the spark plug department.

## Ford Prices Cut 18 Per Cent

Touring Model Now Sells for \$360—Roadster Reduced to \$345

### PRESENT AND FORMER PRICES OF FORD CARS

	Aug. 1 1916	Aug. 1 1915	Aug. 1 1914	Aug. 1 1913	Aug. 1 1912
Touring .....	\$360	\$440	\$490	\$550	\$600
Roadster .....	345	390	440	500	525
Chassis .....	325	360	Not sold	Not sold	Not sold
Coupelet .....	505	590	750	740	740
Town Car .....	595	640	690	740	740
Sedan .....	640	740	975	....	....

DETROIT, MICH., July 31—Starting with Aug. 1 new prices on Ford cars will prevail. The reductions vary all the way from \$35 on the chassis up to \$95 on the sedan. The touring car has been reduced \$80 from \$440 to \$360. The runabout is now \$345 instead of \$390. The chassis alone sells for \$325, whereas it formerly sold for \$360. The coupelet is \$505 instead of \$590, the town car \$595 instead of \$640 and the sedan \$645, which is a \$95 reduction from the former price of \$740.

### Improved Body Lines

Accompanying the change of price there will also be a change of appearance, as the new Ford cars will be fitted with sloping hoods and crowned fenders which will give a new outline. The radiator shape also will be remodeled to accord with the molded form that has now been adopted.

From time to time Ford prices have been reduced materially and it is outside rumor that the eventual aim is a \$250 car with a production schedule of 1,000,000 cars per annum. Recent property acquisitions will more than double the available factory space, and since the schedule is now 500,000 cars a year, it does not seem impossible that the 1,000,000 mark will be reached. Ford reached a production of 1000 cars a day during

(Continued on page 208)

## Studebaker Earns \$6,028,329

Only \$180,000 Profit from War Orders—Common on 10% Basis

SOUTH BEND, IND., Aug. 2—At the regular meeting of the directors of the Studebaker Corp. yesterday the regular quarterly dividends of 1¼ per cent on the preferred stock were declared and the common stock was put on a regular 10 per cent basis by the declaration of 2½ per cent quarterly dividends, which, like the preferred dividend, are payable Sept. 1. Heretofore the common has received quarterly dividends of 1½ per cent plus 1 per cent extra.

Net profits for the 6 months ending June 30, after deductions for appreciation and profit sharing, were \$6,028,329.16, including \$180,000 from war order profits. After deducting the 7 per cent dividends on the preferred stock, this figure is 18.8 on the common stock outstanding and is at the rate of 37.6 per cent for the year.

During the corresponding period of 1915 the corporation's net profit amounted to \$5,774,074.87, which included nearly \$3,000,000 of war order profits, while this year's profits include only \$180,000 from war order profits. Thus the profit earned from regular business this year was \$5,848,329.16, as compared with \$2,774,074.87. The increase this year was thus 11 per cent. On June 30 the total surplus in reserves amounted to \$16,664,160.69. Cash on hand exceeds \$4,000,000 and the corporation is wholly free from indebtedness.

War order contracts are about completed and the corporation is not seeking new business of this character. The plants have been operated at full capacity on regular business for the past 12 months and are earning 80 per cent ahead of last year in the automobile division and 50 per cent in the horse-drawn vehicle division. The domestic business in a general way is 50 per cent greater than at any previous time of the corporation's history.

### Ver Linden Is Oldsmobile Manager

LANSING, MICH., July 31—E. Ver Linden, factory manager and associate executive of the Olds Motor Works, this city, has been created general manager following the resignation last week of Jay Hall. Committee management at the works is now abolished in favor of one-man control. It is expected to increase the output next year to over 20,000 cars.

Before joining the Olds organization, Ver Linden was production expert for the Buick company, managing plant

No. 1. Before that he was in business for himself, under the corporate title of the Michigan Auto Parts Co., which was bought out by the General Motors Co. in 1909. His early training in production methods was gained with the American Radiator Co.

### Goodrich Profits for 6 Months \$4,800,000

AKRON, OHIO, July 29—The books of the B. F. Goodrich Co., this city, were closed on July 1 for the purpose of determining the result of operations for the first 6 months of 1916. After making proper provision for maintenance charges, depreciation, doubtful accounts and all known outstanding current liabilities; the net profits for the period amounted to \$4,800,000, an increase of 20 per cent from the same period a year ago, net then being \$4,000,000. The increase alone is equal to the 6 months' dividend on the \$27,000,000 preferred.

### Nash Motors Co. Incorporated with \$24,999,500 Capital

BALTIMORE, MD., July 29—The Nash Motors Co., which has been organized to take over the Thomas B. Jeffery Co., Kenosha, Wis., as reported in THE AUTOMOBILE for July 20, applied for incorporation before the state tax commissioner here this afternoon, with a capital stock of \$24,999,500. R. F. Herrick, J. Wells Farley, Edward A. Taft and Phillips D. Ketchum, all of Boston, are named as incorporators.

## Marmon Coast-to-Coast Record

S. B. Stevens Covers Distance in 5 Days, 18 Hr. and 30 Min.

SAN FRANCISCO, CAL., July 29—A Marmon car driven by S. B. Stevens, well known in motoring circles around New York, reached San Francisco to-day, having crossed the continent in the record time of 5 days, 18 hr. and 30 min. This is a gain of more than 41 hr. over the record established by the Cadillac eight last May.

The car left Columbus Circle, New York City, at 1.30 a. m. July 24, and on its trip covered a distance of 3476 miles at an average speed of 25.1 m.p.h. The record made by Baker in the Cadillac was established at an average of 18.8 m.p.h. The car traveled as far as Cheyenne at an average of better than 32 m.p.h., but owing to bad roads beyond that point its average was pulled down to nearly 25.

(Continued on page 206)

## Maxwell to Pay 10% on Common

Committee Also Will Recommend Dividends on Preferred—Earnings Over \$5,000,000

NEW YORK CITY, Aug. 2—The executive committee of the Maxwell Motors Co. has decided to recommend to the directors payment in full of the outstanding dividend warrants on the first preferred stock, payment of quarterly dividends on the second preferred at the rate of 6 per cent per year, beginning Oct. 2, and the inauguration of quarterly dividends on the common stock at the rate of 10 per cent per year, also beginning Oct. 2. More than 90 per cent of the first preferred dividend warrants have been converted into first preferred stock.

The earnings of the company for the fiscal year ending July 31 will be in excess of \$5,000,000.

### Signal-Commerce Merger Completed

DETROIT, MICH., Aug. 1—The merger of the Signal Motor Truck Co. and the Commerce Motor Car Co. to form the Signal-Commerce Motor Truck Co. has been completed. An issue of 450,000 shares of stock will include 250,000 shares to be offered to the public at \$6 per share, the remainder of the stock going to the owners of the two companies. Thomas Neal, former president of the General Motors Co., is president of the new concern and Walter Parker is vice-president. Other officers will be announced later.

### International Motor Plans Exchange

NEW YORK CITY, Aug. 2—It is understood that the International Motor Co.'s financial readjustment, which is being worked out in view of the approaching maturity of \$2,800,000 of notes on Nov. 1, will propose an exchange of new first preferred stock with a bonus of 50 per cent in new common stock for the notes.

### Adams Trucks No More

FINDLAY, OHIO, July 29—The Adams Truck, Foundry & Machine Co., of this city, which 2 years ago changed its name to the above from that of the Adams Bros. Co., has discontinued the manufacture of Adams commercial vehicles, to concentrate on foundry and machine shop work.

### Prescott a Stutz Director

NEW YORK CITY, July 29—Sherburne Prescott has been elected a director of the Stutz Motor Corp., succeeding K. R. Howard.



**Exports Total**  
**\$97,464,381**

## Year Ended June 30 Shows Falling Off in Last Month Despite Huge Total

WASHINGTON, D. C., July 29—The exports of automobiles during the fiscal year ended June 30, 1916, reached a total of 77,496 machines, valued at \$97,464,381, together with parts, not including engines and tires, to the value of \$22,536,485, according to figures compiled by the Department of Commerce. During the fiscal year the exports were classified as follows: Commercial cars, 21,265, valued at \$56,805,548; passenger cars, 56,231, valued at \$40,658,833. During the fiscal year of 1915 there were 37,876 machines exported, the value being \$60,254,635, the exports consisting of 13,996 commercial cars, valued at \$39,140,682, and 23,880 passenger cars, valued at \$21,113,953.

While the year's totals mounted high the figures show a decided falling off during June last as compared with the same month of last year. During June last 1416 commercial cars, valued at \$3,551,148; and 4905 passenger cars, valued at \$3,416,396 were shipped abroad, together with parts, not including engines and tires, to the value of \$1,886,746. In June a year ago the exports consisted of 2990 commercial cars, valued at \$8,578,802, and 4418 passenger cars, valued at \$4,785,998.

Manufacturers interested in the ex-

port trade will find much to interest them in the accompanying table, which shows the number and value of vehicles, both commercial and passenger, shipped to various foreign countries during June last.

Canada was the largest customer for passenger cars, taking 1145, with British South Africa second with 553 and France third with 408. Among the South American countries, Argentina made the best showing, taking 369, while Venezuela bought ninety-one, Chile seventy and Brazil forty-seven.

## Weatherproof Body Reorganized—Takes Over Wilson

DETROIT, MICH., July 31—The Detroit Weatherproof Body Co., which was organized during the latter part of 1915, has been reorganized, having taken over the business of the C. R. Wilson Body Co. The company's capital stock is now \$750,000, instead of \$10,000 when it was first incorporated. The concern manufactures the Detroit top, which is a detachable, convertible, all-year-around limousine top of medium price.

The Weatherproof company has secured factory space totaling about 50,000 sq. ft. at 1884 Mount Elliott Avenue and will employ several hundred men. A new factory will be erected some time during the latter part of the year. It is planned to make from 50,000 to 100,000 tops. The officers of the company are: S. P. Douglass, president; Lawrence Moore, vice-president and general manager; H. H. Sanger, treasurer, and H. B. Barbour, secretary.

## Tractors Make Hit in Kansas

## Demonstration Shows Ability of Machines to Plow in Sun-Baked Soil

**By S. P. McMinn**  
*Staff Correspondent.*

HUTCHINSON, KAN., July 27—Kansas soil is proving a difficult test for the farm tractors that have been brought here for the second of the series of eight national tractor demonstrations started July 18 in Dallas, Tex. The Kansas demonstration was officially opened on Tuesday and from then until now the grounds have been thronged. The attendance is, perhaps, not quite as good as it was at Dallas because there is not as great a metropolitan area from which to draw and because railroad facilities are not as good. Still, the crowd is an excellent one and has been drawn from the farthestmost corners of the State.

A fair number of bona fide sales already have been made, though few dealer and distributor contracts have been signed to date. Manufacturers are now signing prospects obtained at the Dallas demonstration, many of them having left men behind for the purpose, so it is likely much of the business here will be deferred until after the furore of the demonstration has subsided somewhat. In a measure this is an encour-

(Continued on page 207)

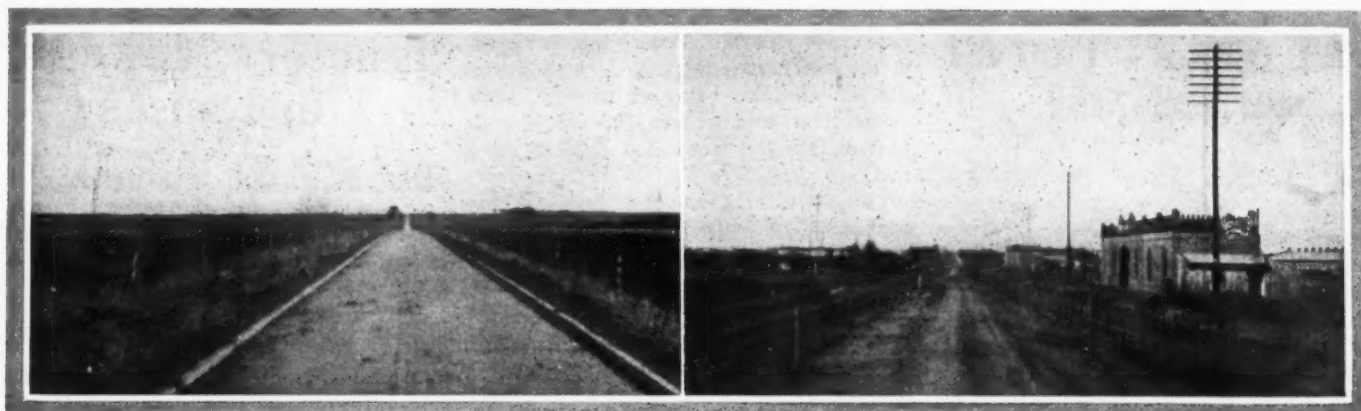
(News continued on page 202)

### Exports of Automobiles, Trucks and Parts for June and 12 Previous Months

	1915		June 1916		1915		12 Months Ending June 1916	
	Number	Value	Number	Value	Number	Value	Number	Value
Passenger Cars.....	4,418	\$4,785,998	4,905	\$3,416,396	23,880	\$21,113,953	56,231	\$40,658,833
Commercial Cars.....	2,990	8,579,802	1,416	3,551,148	13,996	39,140,682	21,265	56,805,548
Parts, not including engines and tires.....	.....	1,139,182	.....	1,886,746	.....	7,853,183	.....	22,536,485
	7,408	\$14,503,982	6,321	\$8,854,290	37,876	\$68,107,818	77,496	\$120,000,866

PASSENGER CARS			PASSENGER CARS			COMMERCIAL CARS		
Country	1916 Number	Value	Country	1916 Number	Value	Country	1916 Number	Value
Denmark .....	40	\$28,939	Brazil .....	47	\$35,412	France .....	280	\$843,290
France .....	408	239,861	Chile .....	70	49,486	Netherlands .....	1	1,200
Greece .....	12	15,408	Columbia .....	5	2,893	Norway .....	10	13,049
Italy .....	80	39,788	Ecuador .....	2	1,365	Portugal .....	81	328,582
Netherlands .....	71	67,701	British Guiana .....	25	11,494	Russia .....	44	157,900
Norway .....	134	105,560	Dutch Guiana .....	4	1,758	Spain .....	7	10,302
Portugal .....	60	68,575	Peru .....	1	1,221	Sweden .....	1	1,700
Spain .....	68	66,910	Uruguay .....	39	22,717	United Kingdom .....	646	1,374,410
Sweden .....	79	72,104	Venezuela .....	91	48,890	Canada .....	46	77,772
United Kingdom .....	87	68,455	Aden .....	3	1,686	Panama .....	3	7,618
Bermuda .....	10	3,760	China .....	72	45,236	Mexico .....	4	6,019
Canada .....	1145	833,551	British India .....	159	111,438	British West Indies .....	4	9,142
Costa Rica .....	2	940	Straits Settlements .....	74	44,344	Cuba .....	22	33,123
Honduras .....	2	1,215	Dutch East Indies .....	154	109,436	French West Indies .....	1	2,310
Panama .....	21	14,514	Hongkong .....	3	3,600	Dominican Republic .....	1	354
Salvador .....	4	5,407	Japan .....	16	12,185	Peru .....	4	4,221
Mexico .....	34	21,863	Russia in Asia .....	3	1,870	Uruguay .....	1	2,351
Newfoundland .....	6	5,422	Siam .....	6	4,499	Venezuela .....	1	1,800
Barbados .....	5	2,652	Australia .....	333	238,542	Korea .....	1	988
Jamaica .....	21	14,919	New Zealand .....	222	162,865	British India .....	3	5,115
Trinidad .....	31	16,727	Philippine Islands .....	31	23,190	Straits Settlements .....	1	1,227
Other British West Indies .....	10	4,042	British West Africa .....	13	10,680	Dutch East Indies .....	14	21,799
Cuba .....	167	129,324	British South Africa .....	553	389,900	Russia in Asia .....	201	598,284
Danish West Indies .....	3	962	British East Africa .....	51	29,618	Siam .....	3	2,913
Dutch West Indies .....	3	1,768	Canary Islands .....	1	800	Australia .....	2	3,920
French West Indies .....	6	5,012	Madagascar .....	7	2,532	New Zealand .....	4	4,361
Haiti .....	2	752	Morocco .....	11	4,810	Philippine Islands .....	27	28,753
Dominican Republic .....	15	8,799	Portuguese Africa .....	11	8,113	British West Africa .....	1	4,397
Argentina .....	369	187,123				British South Africa .....	1	1,445
Bolivia .....	3	3,763		4,905	\$3,416,396	Portuguese Africa .....	1	2,803
							1,416	\$3,551,148



Left—There are 63 miles of this stone block road between Buenos Aires and La Plata. It is Argentine's finest road. Right—Touring road between Buenos Aires and La Plata, which is built in the middle of the dirt wagon road

## South America—II

Argentine Growing Market for U.S. A. Cars—Needs Population—Rich But Backward in Development—Accommodations Excellent—Industries Progressing

### Part II

By David Beecroft

**L**AST week was told the past and present of the automobile industry in the Argentine and how the lower-priced American cars started selling nearly 2 years ago in the agricultural sections and a year ago took a perceptible jump forward in volume of sales. This week we take a closer look at this country, having in mind its possible purchasing capacity for automobiles.

The Argentine republic, with its population of 8,000,000, must not be looked upon as a new country for its oldest cities were founded between 1515 and 1535 so that, measured in years, they are older than New York City. Argentina boasts of its national university at Cordoba, a night's ride by train west from Buenos Aires, because it is many years older than Harvard and perhaps the oldest university in the western world. To-day it has a very high standard and while not the largest institution of the kind is still a potent educational force. So through the country you find evidences of antiquity on every hand.

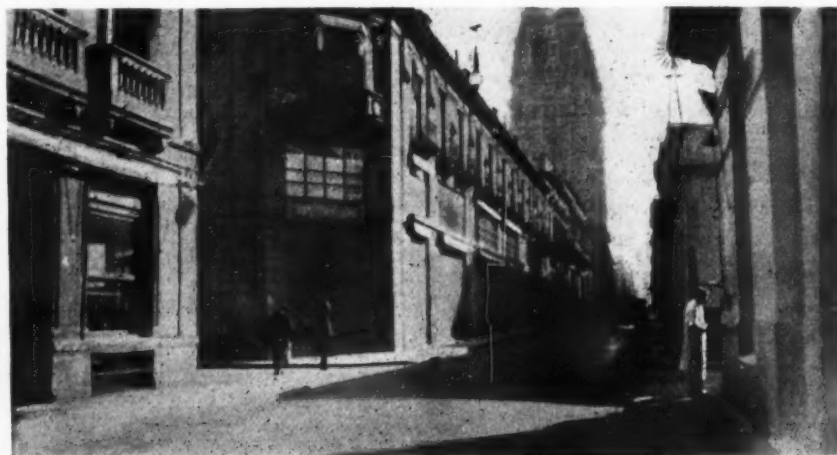
#### Population Too Small

Yet Argentina is an undeveloped land compared with the United States. She has great areas but not enough population. Population is her greatest need. Nature has been kind to her, but industrial progress has been kinder during the past century to North America than to South America. North America is a week from Europe and the old world but South America is 3 weeks off. This remoteness has had its influence.

But other differences have been at work. North America has grown up under the influence of Anglo-Saxons and Teutons, whereas

South America, with the exception of Brazil and Guiana, was reared under the Spanish régime. South American republics threw off the Spanish yoke during the Napoleonic wars 100 years ago. In fact, it was just 100 years ago in July that Argentina finally got its constitution ratified. But the development of Argentina under its own government was slow and it was really not until 1852 when progress started and it is only in the last 35 years that rapid development has taken place. The great meat exporting industry is 35 years old and other industries have sprung up since that date.

To-day the country is making rapid progress, year by year old influences are being thrown aside and more modern measures adopted, but still you must not think of Argentina in



One street in Buenos Aires which is largely used for automobile salesrooms. The J. I. Case Co. occupies the corner

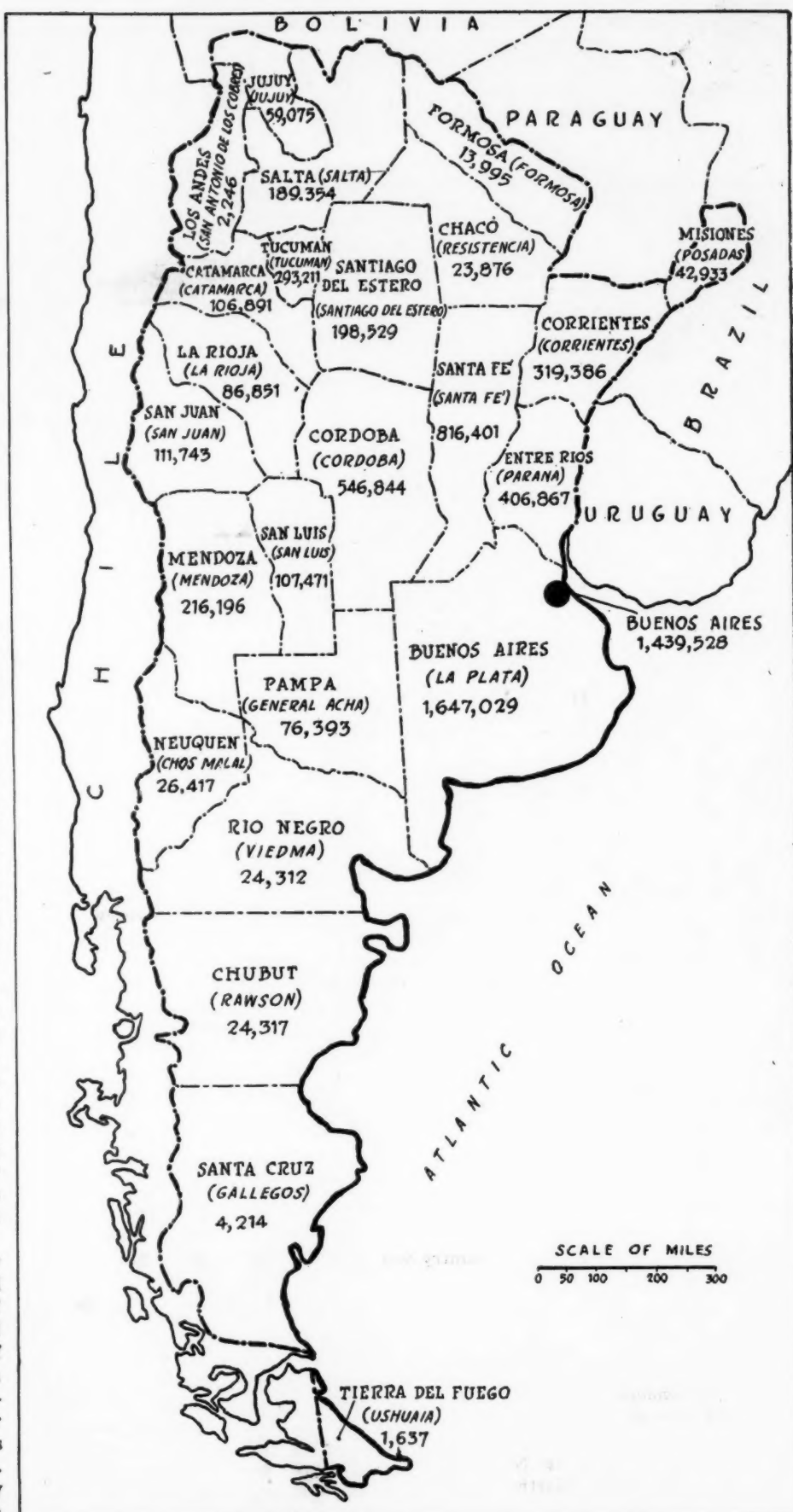


the same way you think of the United States. You must think of it as a land with 8,000,000 people, one-half of whom are Argentines and the other half foreigners. You must think of Argentina as a land very rich in Agricultural possibilities, but laboring under an agricultural system in which land is held in huge areas of 100,000 acres or more and where the small farmer as we know him does not exist. You must not think of it as a land like Iowa, dotted with comfortable small homes located on farms of 160 or 320 acres in extent, but rather as a land dotted with mud huts which our farmers would refuse to live in. Sparsely situated from 10 to 20 miles apart are the city-like homes of the large landowners. This system of farming gives a low percentage of potential buyers as compared with our system of small farms where the majority hold title to their property.

#### A Wide Expanse

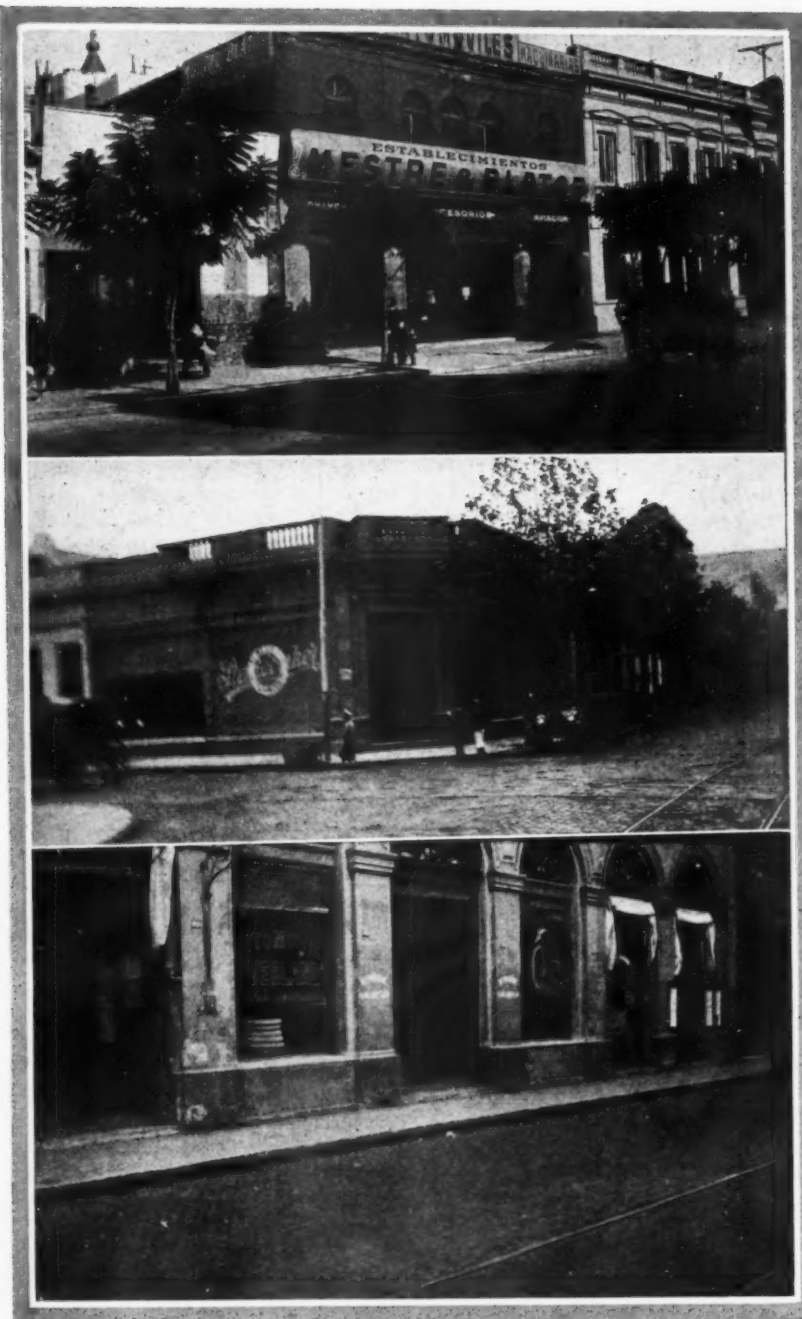
Argentina is not generally settled throughout its length and width as is the United States. There is not enough population. Spread 8,000,000 over the United States east of the Mississippi and you will get some conception of how sparse the population really is. The north central part of the country from Buenos Aires west to the Andes and south for several hundred miles is the most thickly settled. The southern half of the country is very thinly populated, being used partly for sheep grazing and cattle, and there is not any agriculture. The northern section is largely timber lands. That part around the City of Buenos Aires and north is well watered, there being an ample rainfall, in fact too much at times. Going west toward the mountains the rainfall diminishes and irrigation is needed the same as in our western States. In the great grape growing area the rainfall is but 8 in. per year as compared with 37 in. along the river Plate, as the Rio de la Plata is called.

Perhaps the best conception of how Argentina is populated can be had from a brief glance at the divisions of the republic. Argentina is divided into twenty-five divisions, fourteen of them being called provinces and ten territories, the last one being the federal capital and corresponding to our District of Columbia. Buenos Aires is located in the federal capital area. The City of Buenos Aires has nearly 25 per cent of the entire population of the country. In four provinces are located 72 per cent of the total 8,000,000. Imagine 72 per cent of the population of the United States being grouped into New York, Connecticut,



ARGENTINE REPUBLIC, SHOWING DIVISION INTO PROVINCES

The Argentine Republic is divided into twenty-five political divisions, fourteen of which are provinces corresponding to different states in U. S. A. Ten are territories which have not yet attained the political stature of states, and one is a federal district in which the city of Buenos Aires is located, and corresponds to the District of Columbia in U. S. A.



Top—One of the largest automobile supply stores in Buenos Aires. This store carries a large supply of accessories as well as raw materials

Middle—Studebaker salesroom in city of Rosario, which is a six-hour railroad ride from Buenos Aires

Bottom—Overland salesroom in Rosario. This salesroom is typical of many seen in this city as well as in similar cities in the Argentine

New Jersey and Pennsylvania or similar small areas.

The four provinces that contain 72 per cent of the population are Buenos Aires, which contains the city; Santa Fe, Cordoba and Entre Rios, all bordering on the province of Buenos Aires on the west and north. The map shows these, as well as the population of all the others.

When you get outside of these four provinces you get into sparse population; for example Mendoza, the center of the grape industry, has only 277,000 population in the province. It lies on the west, close to the Andes and nearly opposite to Buenos Aires.

#### Good Selling Grounds

The Province of Tucuman in the northwest and where the sugar industry is centered has 322,000 population. San Luis

province which is proving a good selling field for American cars has 116,000 population. Pampa Central, another section midway between Buenos Aires and the mountains with 101,000 population, is proving a good selling ground.

The entire country needs automobiles, it needs motor farm tractors and it needs many light-capacity trucks as well as many heavy-capacity vehicles. There are large possibilities of business at the present time and with normal development which should follow soon after the war closes, there should be much more rapid progress.

We cannot estimate the future buying capacity from the past because of abnormal conditions and also because it is only within the last year that our low-priced cars have taken hold. During the first 3 months of 1916 Argentina imported 1462 automobiles, which is nearly as many as in all 1915. The 1915 figures were 1838 cars imported. The 1462 cars imported this year were largely American machines, the only European country furnishing a few being Italy. If this rate of importation continues for the remaining three-quarters of the year the figures will approach 550 machines, being higher than 1911, the year before the crisis and when the importations from Europe reached their zenith.

The figures of 1462 for the first 3 months of this year do not give an adequate conception of the demand there for American cars, because many dealers were months behind in deliveries, due to lack of shipping facilities from New York. Some dealers did not receive a single car in January and February, 2 of the best selling months, and were receiving cars in June that should have been on their selling floors Dec. 15. If Argentina could have received in January, February and March all of the American cars it needed the figures would have been double 1462. One Buenos Aires dealer received nearly 400 cars in May and June that should have been in his hands in January. He will be compelled to hold them to the opening of the selling season in November.

#### 18,162 Cars in Three Months

In the last 5 years and during the first 3 months of this year Argentina has purchased 18,162 cars. The majority of these are European cars which gradually rose in sales until 1911 and have gradually fallen since. The importations for the different years are:

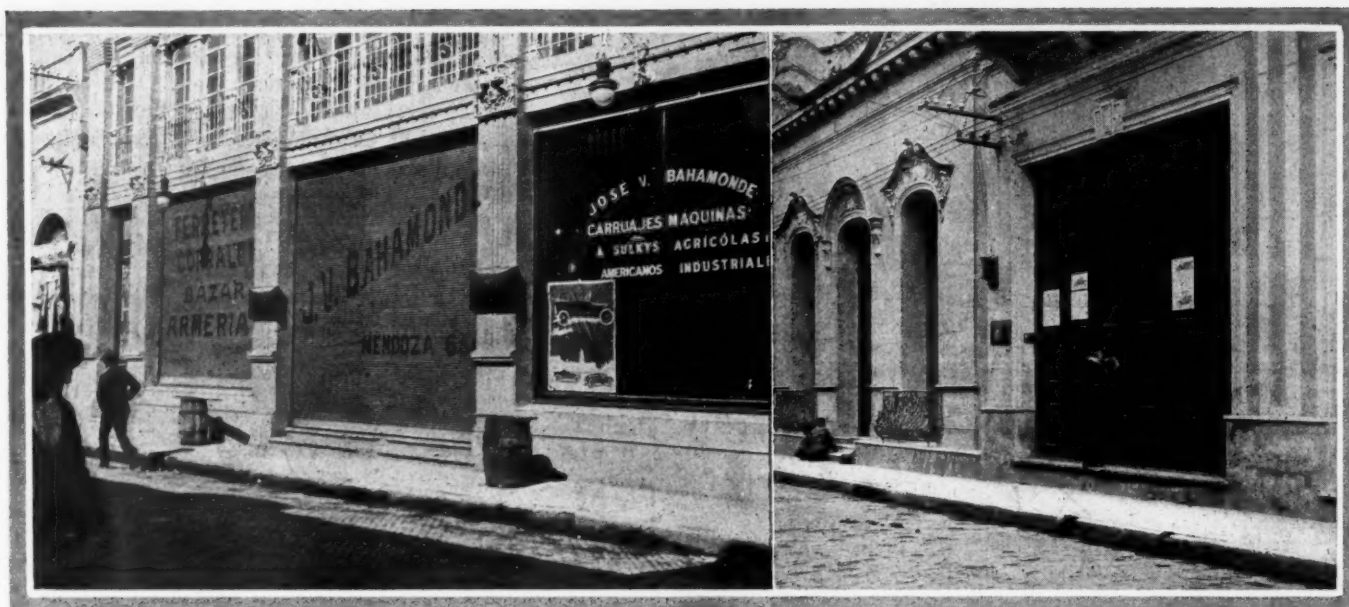
Year	Cars	Year	Cars
1911.....	2461	1914.....	3004
1912.....	4281	1915.....	1838
1913.....	5115	1916 (3 mo.)..	1462

When these importations are translated into car values in dollars the figures show a great falling off. The European cars represented expensive machines, generally with costly limousine bodies made by the finest body builders in Europe. Against this you must contrast the low-priced American machines of the last 2 years.

Too much attention must not be placed on these figures. They are accurate, but must be interpreted in the light of the great change that has taken place with regard to American cars. In reading over these figures you must recall that our cars have started selling on farms, where cars never sold before. You must remember that, while our cars have been selling, storerooms have remained filled with expensive European cars.

These figures are more eloquent than they appear. They





Left—Studebaker salesroom in Tucuman, the capital of the province of Tucuman, and the heart of the sugar district. Right—Ford agency in Tucuman, showing heavy shutters for doors and windows when store is closed

are rather suggestions of what the future has in store. You must rather be looking ahead when contemplating on them than looking back to the figures of previous years. You must interpret them in the light of prejudices against our cars that have been overcome. You must recollect that these sales have been made in spite of the lack of roads. They have been made in spite of deep founded prejudices against our cars in all of the cities. They have been made in spite of depression due to the war. They have been made in spite of gasoline selling as high as 70 cents a gallon. They have been made in spite of freight rates of \$1 per cubic foot instead of 35 cents. They have been made in spite of car prices having been raised. In this light the figures are eloquent in the meaning they convey.

#### Business Methods Win

These increases in sales have largely been made by two or three concerns who have gone into the Argentine in a business way and with a determination to build up a business there. They have generally opened their own branches, and, in short, established their own selling policies throughout the country. They have stocked up with a big equipment of spare parts and have demonstrated to the Argentine that they mean business and are there to stay. This impresses the Argentine. He delights in seeing the United States

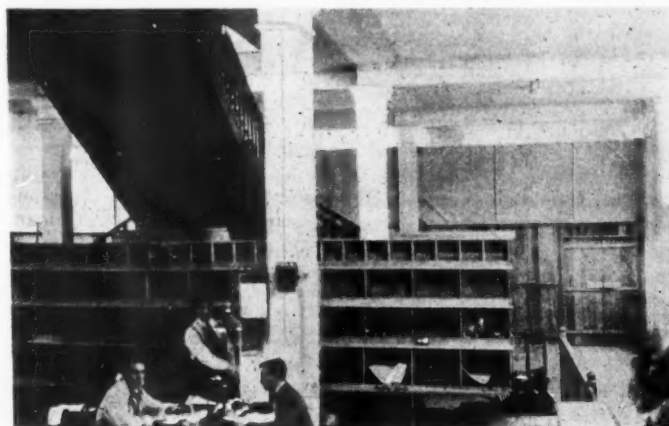
citizen or the citizen from any other country coming into his land to live. The Argentine is just as proud of his land as we are of ours and every permanent business investment of this nature pleases him and builds up that spirit of confidence which is so essential to Latin-American business.

#### Spare Parts Essential

A good stock of spare parts is the biggest selling argument in Argentina for any American car. You realize the value of such when you think of 3 weeks to send a letter for a spare part on boat, 3 weeks more for it to return on boat, and then perhaps a week or so waiting for a boat. Add to this loss of time in customs and you are out of the use of your car for 2 months. In the United States with cheap telephone and telegraph arrangements your car would not be laid up for more than a day or so. It is no wonder then that any American automobile manufacturer contemplating going into the Argentine market must make up his mind to stock up with spare parts. If he does not he had better leave the market alone.

Further glimpses of the Argentine may not be amiss, for the sole purpose of this article is to give a clearer conception of the country so that its possibilities may be better understood.

Argentina is not a manufacturing country in that it has few minerals and little if any coal. Up to the war coal was all brought from England but since then the United States has been shipping all it can get ships for. The lack of coal will prove a serious handicap, but there are possibilities that electric power and petroleum may partly make up for this lack. There are great water powers well located and there are two different petroleum deposits, which, while they have not been well developed the feeling is that there is a good future for them. One is in the south at Rivadavia and the other in the north in Catamarca. The country to-day is a great cattle, sheep and horse country with much wheat, corn and other grains. It is a greater grain exporter than the United States. Unfortunately at present for Argentina Europe has been buying more grain from Canada and the United States, as the freights are shorter, and Argentina finds itself with much of the present stock stacked in sacks at the different railroad stations and much of it on the farms. There will be a very heavy grain loss, because the country is without a system of railroad grain elevators.



Basement of Ford Agency in Rosario, showing a small corner of spare-stock department. It is as orderly as in any U. S. A. branch



Top—The building with the arched entrance is an example of the newest style of Buenos Aires garage construction, with capacity for upward of 100 cars. Middle—Typical example of private garage, Buenos Aires. Bottom—Two-story Buenos Aires garage, with capacity for 100 cars. Electric elevators and all other modern conveniences are in use.

The country has many factories of varying kinds. There is a large boot and shoe industry; there are many flour mills; wood-working factories of different kinds are being built and a variety of others including dye factories, etc., are being established. Land heretofore has offered the greatest opportunities for wealth and it was but natural that little attention would be given to manufactories. With fuel shortage the handicap was greater. To this can be added sugar, wine, rice, hides, meat packing and other industries.

It is much easier to do business in Argentina to-day than it was a few years ago. Buenos Aires has a large branch of the National City Bank of New York. This bank, already in sixth position in a list of twenty, has a very elaborate credit department and has been pushing its commercial departments rapidly. The bank is prepared to give almost any

information on credits and its establishment has greatly facilitated doing business with the United States. Through it any American maker can secure all necessary credit ratings. It used to be that before this only American bank was established money transactions had to go through London, Paris or Berlin. To-day it is as easy to do business from Buenos Aires to New York as to any of the European capitals. True, England, Germany, France, Italy, Belgium and other European lands have most of the banks well established and we have only one, but our start has been made and now the dollar is becoming known in Argentina as well as the pound sterling. The ice has been broken. The American maker has now adequate facilities at his disposal to do business.

#### Railroads and Hotels Good

American automobile makers will not have to confine their business in Argentina to Buenos Aires, but will find nearly a score of other cities in which agencies can be placed. There are already several agencies in such cities as Rosario, Cordoba, La Plata, Bahia Blanca, Tucuman, Mendoza, San Luis, etc. In the smaller places showrooms are not maintained, and often the car is sold by the firm handling National cash registers, Remington typewriters, or Singer sewing machines.

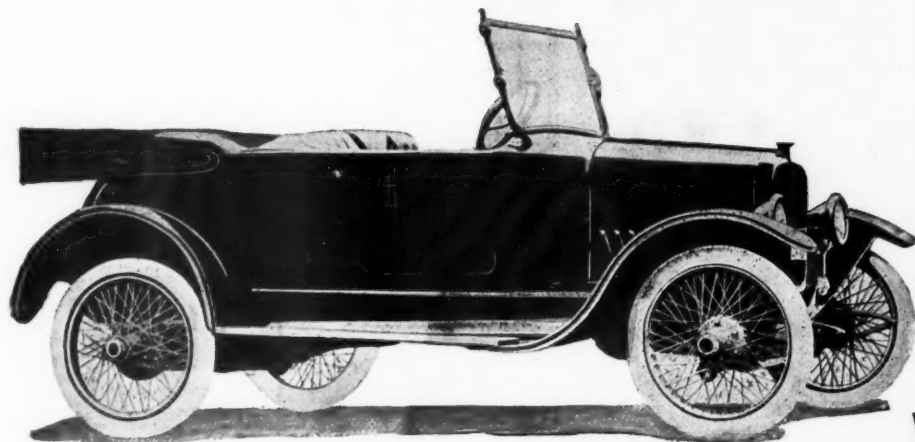
There are excellent railroad facilities to all of these cities; in fact, Argentina has good railroad systems and plenty of them. The sleeping cars and dining cars are as good as you get in Europe, being generally of English manufacture. You find satisfactory hotels nearly every place you go; in short, there are no serious obstacles to the general development of the business.

Perhaps roads, or the lack of them, is the heaviest handicap. They are utterly lacking in many places. The country has few real highways although there are some sections where road building is easy. Buenos Aires is located in a plain as level as Chicago. The soil is black loam and the rainfall fairly heavy. This is the richest section of the country and has the poorest roads. Three real efforts at road building have been made, but yet there is only one city you can tour to by motor car and that is La Plata, 65 miles, and the capital of the Province of Buenos Aires. There are two good roads there, roads as good as in the United States. One road is a new stone block one, not cobblestones, but a road as smooth as a brick pavement, which is just completed. It is ideal for motor truck traffic and equally good for passenger traffic. This road was built by a French engineering organization and resembles a railroad right-of-way. It is as straight as an arrow until lost in the horizon beyond. Mile after mile it stretches over the pampas in this straight course, and as level as a table all of the way. It is a beautifully built road with stone curbs on each side just like a city boulevard, and with excellent bridges every few miles in places. It is a monument to road building in South America.

There is another good dirt road built some years ago between Buenos Aires and La Plata which is a fine motor road, horses being barred from it. The wagon road was very wide, perhaps three times the width of an American road and the motorists got permission to build a motor road in the center of it. To-day the motor road is hard and dry, even after rains, whereas the wagon roads at the sides are literal quagmires after rains. The third road out of Buenos Aires leads to a great summer picnic ground.



# Briscoe Brings Out New Four



New Briscoe Twenty-four  
five-passenger touring car  
which sells for \$625

**B**RISCOE has a brand new car fitted with a four-cylinder engine and priced at \$625 with either a five-passenger touring or a four-passenger roadster type. It is a distinctive car in a number of respects, both in chassis design and body arrangements. The Briscoe Motor Corp.'s plan of quantity production is doubtless one factor which makes the price possible.

Following the latest body contour, the new Twenty-four, as it is called, has a rather high and narrow radiator, and a sloping hood and body. There is no transitory curve where hood joins body, and at the cowl, the body is rounded over in line with the present tendencies in body fashions. There is no doubt that body shaping has come to the point where speed is suggested in every curve, and it is to be hoped that the fashion will not change. The Briscoe designers have evidently caught the idea, for a distinct suggestion of speed and power is given by the lines of the new bodies. Then, a slanting windshield has been fitted, this alone being a sort of finishing touch to a very pleasing general body outline.

## Ample Leg-Room

The new Briscoe is built on a wheelbase of 105 in., and the space has been commendably utilized to give a very roomy car. Like most other designers, the Briscoe sponsors have seen to it that the old criticism of not having sufficient leg-room in the drive seat to give the driver comfort does not hit their new creation.

Looking at the mechanical specifications, we find a  $3\frac{1}{8}$  by  $5\frac{1}{8}$  four-cylinder block engine having a detachable cylinder head plate that gives access to the valves; an inverted type of cone clutch; three-speed gearset in unit with the rear axle; floating rear axle in which is incorporated the Bailey gearless differential; elliptic front and rear springs; tapered frame and 30 by  $3\frac{1}{2}$ -in. tires all around.

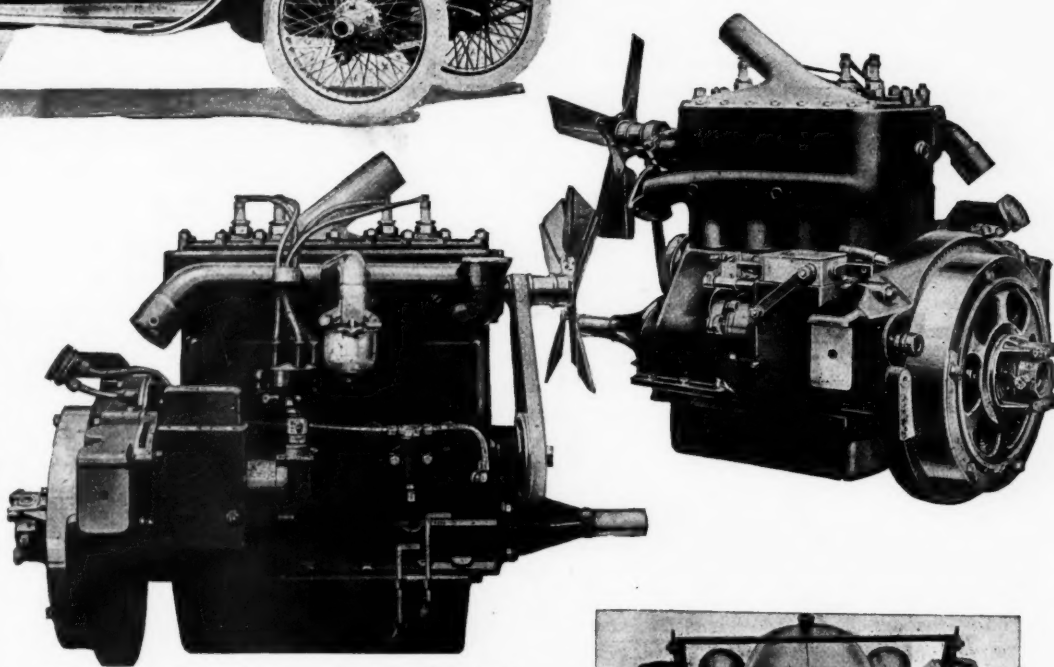
$3\frac{1}{8}$  by  $5\frac{1}{8}$ -In. Engine

On 105-In.

Chassis—Bailey Gearless

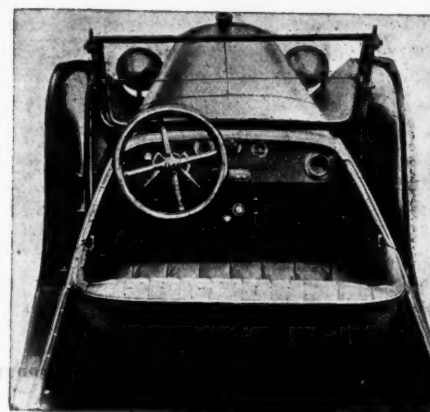
Differential

and Rear Axle Gearbox



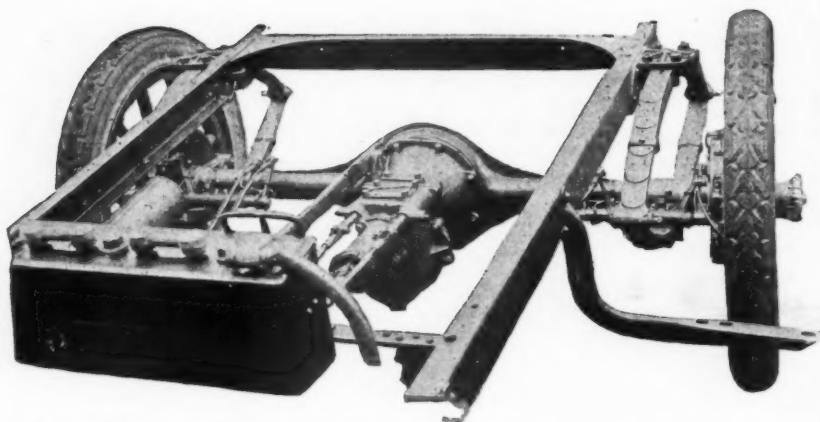
Both sides of the  $3\frac{1}{8}$  by  $5\frac{1}{8}$  four-cylinder block engine used in the new Briscoe Twenty-four, showing mounting of accessories

Illustrating the tapered stream lines of the new Briscoe touring car model



From the above it will be evident that the engine has quite a long stroke as compared with the bore, the dimensions giving a stroke-bore ratio of 1.64 to 1, which is somewhat greater than the average. The formula accords the engine 15.64 hp., but it is capable of over 30 hp., due to the long stroke and general design. A better idea of this may be gained from the fact that while the bore is not large, the long stroke raises the piston displacement to 157.2 cu. in., which figure is a direct indication of the power.

Of the type in which the upper part of the crankcase, which carries the crankshaft and camshaft as well, is in unit with the cylinder block, the engine provides for quick valve accessibility by the use of a detachable plate that extends the length of the top of the casting over the eight valve chambers,



Rear of Briscoe Twenty-four chassis, showing rear axle gearbox, unusual spring mounting, etc.

this being on the right half of the top. The left part of the top is taken up by the large water outlet connection which works in conjunction with thermo-syphon cooling. The bottom of the engine is inclosed by a pressed steel pan which acts also as the oil reservoir. On the right is carried the Splitdorf gear-driven generator, with the ignition distributor mounted in unit, and on the left is the starting motor, also a Splitdorf unit. It connects to teeth in the flywheel face. The right side being the valve side, the manifolds are placed here, with the carbureter mounted quite high up so that there is no interference with reaching the tappets.

#### Rear-Axle Gearbox

Since the gearset is not in unit with the engine, but occupies a position as a part of the rear axle, the flywheel is uninclosed.

With direct oil feed to the bearings and gears, the lubrication system is a combination of splash and force feed. The oil pump is positioned on the right forward side of the crankcase and is driven off the camshaft. The oil leads to the gears and sight feed gage run outside on the right. In accordance with usual practice for this kind of oiling, the troughs under the connecting-rods are kept supplied, and the rod ends throw the oil up into the cylinders and onto the various bearing surfaces, from which it eventually drains back into the crankcase. To tell the height of the lubricant in the supply, there are two indicating levers located on the right side of the motor just below the oil pump. There is also an indicator which tells whether or not the oil is flowing as it should. This occupies a rather unusual position, in that it protrudes through the toeboard within sight of the driver, and ahead of the control levers. Thus it is out of the way and can be readily seen, but the piping is reduced to the minimum, which is a commendable point. The oil filler and breather is in a new place too, it being forward on the right, and high up so as to be accessible for oil filling. It enters the cylinder block just below the exhaust manifold, and above the cover plate that houses the valve tappets.

#### Thermo-Syphon Cooling

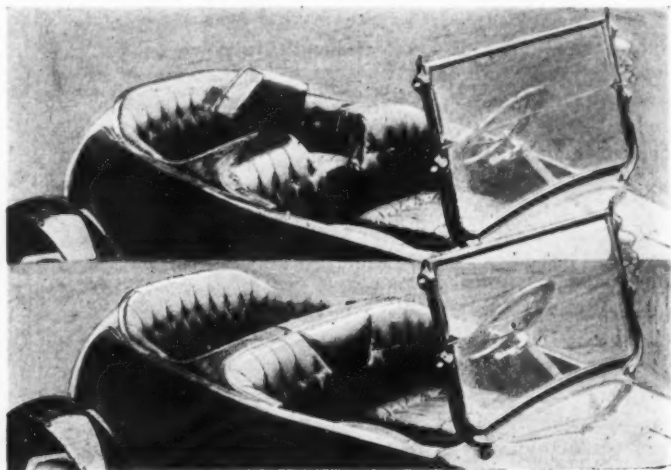
In its adaptation of the thermo-syphon method of cooling, Briscoe has placed the engine sufficiently low as compared with the radiator to give proper thermal action. To further meet the demands of this simple cooling, the radiator top tank is large, and the water flows to it from the large water outlet connection that extends the length of the top of the cylinder casting, as already pointed out. There is also a large water inlet which is attached to the left side of the cylinder block, and extends all along it so as to give good water distribution, and further it is of sufficient size to insure against restriction of the flow. Thermo-syphon cooling is very efficient for engines of this size where it is properly

applied, and Briscoe engineers have evidently been fully aware of the possibilities of correct fitting of the system, judging from the free passages, large size, etc. A four-bladed, pressed-steel fan is applied, driven from a pulley on the front end of the camshaft by a flat belt. The fan is mounted in a support that is integral with the cylinder casting, and there is provision for rocking the fan shaft so as to give the right belt tension.

Drive of the generator is unusual, for it is from the rear end of the camshaft through gear connection. The generator is positioned close to the flywheel on the valve side of the engine, and the gearing is housed in the extension of the right rear supporting arm of the engine. The ignition distributor is mounted on the front end of the generator unit, and there is bevel gear driving connection between its vertical shaft and the horizontal armature shaft, insuring positive and silent drive at all times.

Passing to the clutch, this unit also presents some differences over average practice, principally in the fact that it is of the inverted variety. That is, instead of pulling back from the motor to release, it is shoved toward the cylinders, the action being just the reverse. The cone is leather faced, and is possessed of six spring plungers acting against the under side of the leather at equal intervals to insure easy action and prevent grabbing. As the throwout mechanism must act to push the cone inward when declutching, a simple universal coupling acting directly against the center of the cone and clutch spring is made possible. A forged arm extends out from either side of the engine support, and the pedal shaft is carried transversely by these arms, the center of this cross shaft having a simple leverage connection with the clutch coupling. The construction should make a pedal action that does not require undue foot pressure, although exerting a multiplied force on the cone.

Back of the clutch there is a universal joint and then the open driveshaft runs directly back to the rear universal that is just ahead of the gearbox. There is a light torsion bar running from the front of the axle housing to the intermediate frame cross member, this assisting in taking the torque and drive. Compactness is very noticeable in the gearbox, which has three speeds, with the countershaft mounted directly below the mainshaft. The latter runs on taper roller and ball bearings, while the countershaft is carried on plain bushed bearings. Control rods run parallel with the driveshaft from the H-gate that is attached for-



Briscoe four-passenger body, showing how the hinged upholstery in the center of the front seat back furnishes an aisleway to the rear seat



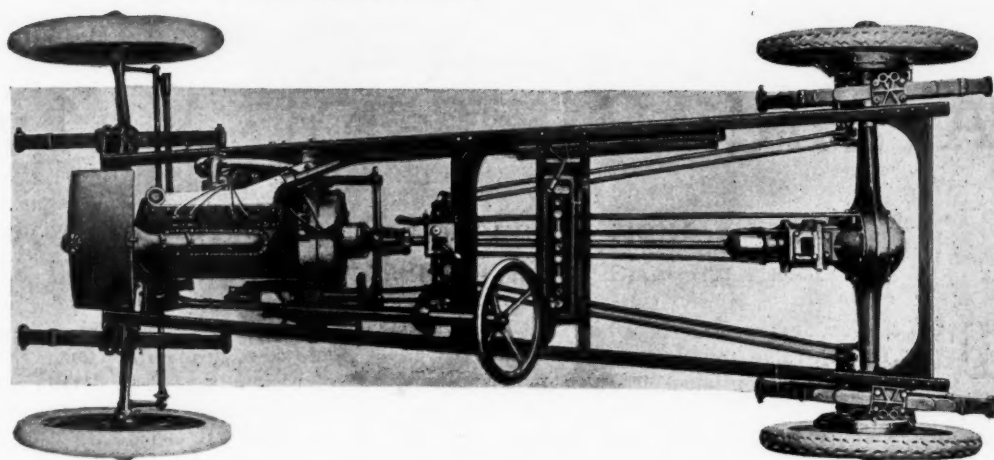
ward to the intermediate cross member of the frame. These control rods are of quite large diameter, and should not have any tendency to whip, and special provision has been made in their mounting so that there is no likelihood of rattle.

Although the pressed-steel rear axle presents no unusual features outwardly, it is fitted with the Bailey gearless differential, which acts through a series of ratchets and pawls, so that the wheel having the most traction gets the most power, in contradistinction to the standard differential in which the free wheel receives the bulk of the power. The axle possesses the qualities which put it in the floating class, in which the weight of the car is carried entirely on the axle tubes, with none to be sustained by the axle shafts, they being given the single function of driving the wheels. Hyatt roller bearings carry the axle shafts, acting in conjunction with ball-thrust bearings which care for the thrust.

#### Easy Riding a Feature

Easy riding is featured in the new Briscoe, due largely to the use of full elliptic springs both front and rear, with special attention paid to the attachment of these suspending members so that they have free action. The rear pair are underslung from the axle, and substantially joined to the frame by brackets of ample proportions that extend out from the side frame rails in close proximity to the rear cross member, being the place where the frame is well braced to take care of the load imposed. The front pair attach similarly at the extreme front end of the side members.

A straight taper is given the frame from front to rear, thus allowing for a moderate turning diameter, and for rigid attachment of the narrow radiator that fits snugly between the side members. Besides, a sloping frame makes the best kind of support for the tapering body, holding it well along its entire length.



Chassis of the new Briscoe, showing the taper frame, layout of the power plant, rear axle gearbox, and mounting of the springs

In this chassis, the storage battery support is given much attention. There are two cross members utilized as a cradle for the long and narrow U-S-L battery that extends up under the front seat of the body. The battery maker cannot find any fault with this rigid battery foundation, and it should be a factor for prolonging the life of the storage cells.

#### Four-Passenger Body

The four-passenger body is deserving of special mention on account of the originality displayed in the arrangement of the front seat back. Of the sociable type with the rear seat close up to the front the aisle between the two front seats which allows access to the rear seat, is normally closed by a hinged portion of the back of the forward seat. This, when in closed position, affords a back rest all the way across the front seats, but when it is desired to get into the rear compartment, the entire center upholstery section hinges out of the way and gives an aisleway that is amply wide to permit ready passage. The rear of the body has a torpedo shape, and altogether the four-passenger body should prove a very attractive model.

All the fitments and standard equipment of the modern machine are included in the makeup of the Briscoe, and while wood wheels are standard, wire wheels, which to many add a touch of distinction, may be had at an extra figure.

## 129 Makes of Trucks in Kansas

ACCORDING to an analysis of the registrations of motor trucks in Kansas made recently there are 129 different makes of commercial motor vehicles in use in that State. Of the total of 1639 vehicles, Ford delivery cars lead with 488,

International 286 and Buick 145. Reo has 96, Studebaker 47, Overland and G. M. C. each 36, Avery 31, Republic 28, Cadillac 26 and the rest, headed by Packard, Velie and Koehler with 18 each, range down to 56 makes with one each.

Ford	488	Mack	7	Auburn	3	Cunningham	1	Meade	1
International	286	Brush	6	Carter	3	Cameron	1	National	1
Buick	145	Chase	6	Franklin	3	Commonsense	1	Northern	1
Reo	96	Detroit	6	Glide	3	Cartercar	1	Oakland	1
Studebaker	47	Fuller	6	Gleason	3	Crow	1	Palge	1
Overland	36	Lambert	6	McIntyre	3	Diamond	1	Palmer	1
G. M. C.	36	Lincoln	6	Oldsmobile	3	Dorris	1	Premier	1
Avery	31	Pierce	6	Pope	3	Davis	1	Panhard	1
Republic	28	Chalmers	5	Speedwell	3	Dennison	1	Pullman	1
Cadillac	26	Federal	5	Sellers	3	Everitt	1	Rock Falls	1
Packard	18	Grabowsky	5	Thomas	3	Economy	1	Royal	1
Velie	18	G. V.	5	Alco	2	Electric-car	1	Reinhold	1
Koehler	18	Galloway	5	Commerce	2	Elmore	1	Stevens	1
Wilcox	15	Rapid	5	Garford	2	Grant	1	Sequoia	1
Kelly	15	Reliance	5	Jeffery	2	Giant	1	Sharon	1
Maxwell	13	Regal	5	Mason	2	Halliday	1	Truck-car	1
Kissel	10	Rambler	5	Modern	2	Hudson	1	Trumbull	1
Vim	10	Willis	5	Motorwagon	2	Henry	1	United States	1
Flanders	9	Waverly	5	Queen	2	Haynes	1	Victor	1
Smith	8	Wichita	5	Schacht	2	Krit	1	Winton	1
Dart	8	Decatur	4	Sternberg	2	Kopke	1	Ward	1
Saxon	8	Gramm	4	Argo	1	King	1	Wayne	1
Jackson	8	Indiana	4	Bingham	1	Lexington	1	Warren	1
E. M. F.	7	Sampson	4	Bauer	1	Marquette	1	Westcott	1
Locomobile	7	White	4	Case	1	Menominee	1	Zip	1
Mitchell	7	Autocar	3	Crawford	1	Marathon	1	Total	1639

# Aland Sixteen-Valve Four

New Detroit Production To Have Racing Type Aluminum Engine—Diagonally-Connected Brakes on All Four Wheels

**F**OR the last few months there has been considerable talk of sixteen-valve four-cylinder cars, and the latest of these to be mentioned is the Aland, made by the Aland Motor Car Co., Detroit, Mich. This concern is just organizing and expects to be in a position to start manufacture about Dec. 1. The company is incorporating under the laws of Michigan with a total capital of \$500,000.

The line will be made up of one chassis model with several body styles, but production will first be started on a five-passenger touring car and a two-passenger roadster. The paramount feature of the design is the use of a high-speed sixteen-valve aluminum engine, and in keeping with the intention to have the weight as low as possible throughout, the car will be characterized by a liberal use of high-tensile steel. Throughout the entire design the matter of price will be a secondary consideration and as a result this has not been definitely fixed, although in all probability the car will retail for about \$1,500.

65 Hp. at 3200 R.P.M.

While rated at 14 hp., according to formula, the manufacturers state that the engine will develop more than 65 hp. at 3200 r.p.m. The cylinders are cast in a single block and made with the crankcase as an integral part. This is an aluminum casting and the cylinder walls are provided with cast-iron sleeves which are pressed into place. The bore of the engine is 3 in. and the stroke  $5\frac{1}{2}$ , giving a piston displacement of 155.5 cu. in. and, according to the maker, 1 hp. from every 2.39 cu. in. of displacement. This high efficiency is explained by careful attention to balance and to the high volumetric efficiency due to the extra large valve areas and the fact that there are four valves per cylinder. Each of these valves is  $1\frac{7}{16}$  in. and opens directly into the combustion chamber being operated by an overhead camshaft which is located in the alley between the valves. One cam operates two valves through double rocker arms which are provided

with roller followers at both ends to minimize friction. The rockers are offset 2 to 1, so that, while the cam lifts the rocker but  $\frac{9}{64}$  in., the valve is lifted  $\frac{9}{32}$  in.

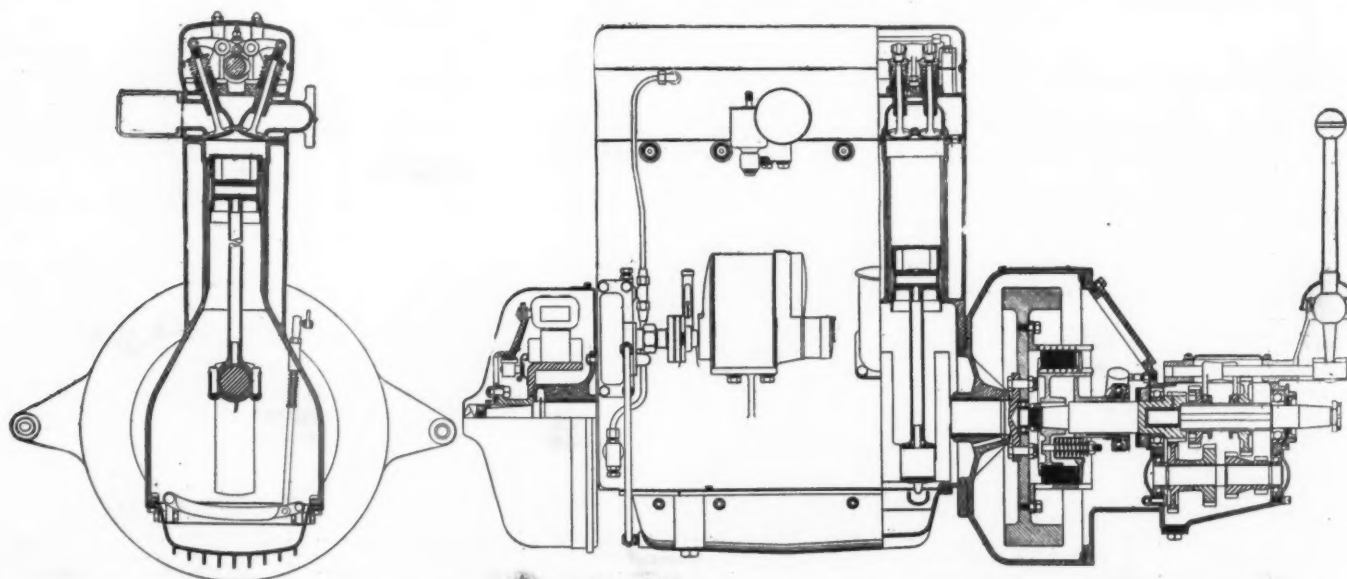
An aluminum alloy casting is also used for the cylinder heads. It is held in place on the cylinder block with twelve  $\frac{7}{16}$ -in. nickel-steel studs placed in such a position as not to interfere with water circulation and to be accessible. This cylinder head casting contains the valves, springs, guides, brackets, camshaft, etc., and forms a separate unit which can be removed without disturbing any adjustment. A feature of importance is that the entire valve mechanism runs in a bath of oil and is protected from dust by means of an aluminum cover which fits over the entire top of the engine block.

## Tubular Connecting-Rods

Aluminum alloy is used for the pistons which are provided with three rings, two above and one below the wrist pin. A groove is cut in the piston below the bottom upper ring with six small holes drilled into this as an extra precaution against superfluous oil.

A nickel-steel wristpin is used and this is free to oscillate in either the connecting-rod or the piston. A small steel ring fits into a groove on either side of the wristpin and prevents it from working out to one side and scoring the cylinder wall. The upper end of the connecting-rod is provided with a bronze bushing and the connecting-rods themselves are of tubular type made from chrome vanadium steel. In manufacture it is purposed to pay particular attention to the balance of these parts and also to make them secure against breakage. Nickel-steel bolts are used to hold the cap on the lower end of the connecting-rod and throughout the sections are such as to provide a good factor of safety.

Three bearings support the crankshaft. This is of chrome vanadium steel, heat treated and balanced so as to be in



Showing the simple character of the Aland overhead camshaft engine. Observe the U. S. L. starter at the front end of the crankshaft



running equilibrium at 4000 r.p.m. The shaft is machined all over and at the rear is fitted to a cast-iron flywheel, while in front is the U. S. L. starting and lighting system, which is not in this case a flywheel installation. The unusual installation of the U. S. L. starting and lighting system on the front end of the crankshaft is quite accessible and in this case a stamped steel housing incloses it.

#### Has Diagonal Brakes

Another novelty in American design is the use of diagonally connected brakes on all four wheels. This system was originated by the Argyll company in Scotland and operates as follows: The right rear and front left brake are interconnected and operated by either foot or hand, while the left rear and right front are operated by the other control. The effect of this is that, when applying one brake, there is left on either axle one wheel which is rolling free and therefore has the maximum ability to keep the car traveling in a straight line. With this diagonal arrangement it is possible to lock one wheel on each axle and still have control over the steering. The four brakes are all expanding types and act equally well whether the front wheels are straight or at an angle.

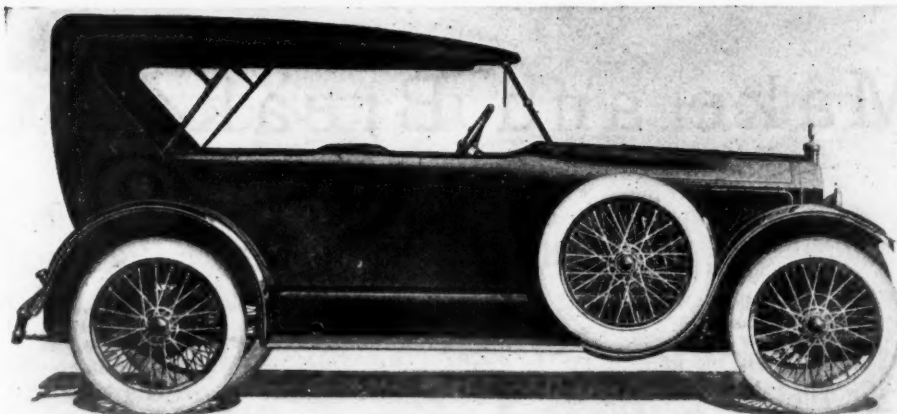
Naturally with such a high speed engine, lubrication has been carefully studied. Oil is first pumped from the cast aluminum pan which has a capacity of 6 qt., to a distributor tube cast integral with the cylinder block. On the top of this tube is located the pressure regulator for the overhead compartment, and a small tube delivers oil to the camshaft bearings and other valve parts. A vertical lead directly over the center crankshaft bearing carries the oil back from the overhead compartment to the crankshaft, lubricating the center bearing. In addition there are adjustable troughs beneath the crank throws which take care of the wearing surfaces within the motor and the front and rear main bearings are oiled by separate leads from the oil pump distributor. Beneath the troughs and extending the entire length of the crankcase is a strainer which is readily removable for cleaning.

Three point suspension is used with each point allowed to move, as each is mounted on a swivel. The two rear points are fastened to the steel stamped supports by means of self-lubricating bolts. The front end is bolted to a cross member at the center and the flywheel is completely housed within the cast aluminum bell housing, the gearbox and clutch case bolting directly to this to form a complete unit power plant.

A Raybestos-faced multiple disk clutch is used with alternate disks of steel and the clutch release is provided with a ball bearing, so that only light pressure is needed to release the clutch. The gearbox is a three-speed selective type with gears and shafts of chrome-nickel steel. The shafts are mounted in large double-row, self-aligning ball bearings.

From the gearbox the drive is taken to the rear axle through a large diameter nickel-steel tube with universal joints at each end, both drive and torque being taken in Hotchkiss style through the springs. The rear axle is semi-floating and is equipped throughout with Timken bearings. The driving gears are spiral bevel and a bearing is located on either side of the pinion, giving a substantial mounting and also shortening the pinion shaft and decreasing the amount of axial movement of the rear universal joint.

A bottle neck frame is used, allowing a wide rear which conforms to the shape of the body sills, narrowed at the front to allow for a short turning radius; in fact, the makers state



Aland four-cylinder, five-passenger touring car

that the car is able to turn about in a radius of 16 ft. 4 in. In carrying out the construction all the frame cross members and brackets are hot riveted in place, the spring horns at both ends being provided with bronze bushings.

The springs are semi-elliptic all around and are designed to be approximately flat under load. The rear springs are 55 in. long and 2 in. wide and are underslung. The front springs are 37 in. long and 2 in. wide. The springs are attached to the frame by forged shackles and these also are provided with self-lubricating bolts. A full set of shock absorbers is provided as standard equipment.

Conventional steering is used with worm and full gear and adjustments to take up wear at different points. The steering wheel is an 18-in. walnut nobby grip and the control levers work on a full circle control plate instead of the conventional sector.

On this chassis, which has a wheelbase of 122 in., there will be several types of bodies which will be interchangeable. The five-passenger open touring and the two-passenger touring roadster will be the first in production. The five-passenger design is featured by a deep cowl with a built-in sloping windshield. The body is a double cowl style and is made of sheet aluminum over a sub-structure of wood. The seats are low and are tilted back to give ample leg-room. A great amount of attention has been paid to detail in equipment and the car is provided with five Rudge-Whitworth wire wheels with 33 by 4 tires.

#### Efficiency versus Neatness

THERE is one respect in which many motorists of experience find a criticism for the modern speedometer despite its better durability and greater accuracy. This is in the nature of the dials employed. The almost universal style to-day is the horizontal indicator which brings different figures opposite a little "window" in the cowl board. This is much neater than the old style full dial with a moving pointer and the speed figures set around like those of a clock, but the latter scores heavily when the driver wants to read the dial quickly.

With the old pattern instrument it was not necessary to look directly at the dial. After using the car a short time the speed could be seen out of the corner of the eye, as the position of the pointer told the driver what speed he was making without his having to actually read the figures. With the modern design the figures must be read, and though this takes but an instant's glance, yet it does demand greater concentration of thought than did the old pointer.

The pointer pattern of dial could be made as neat as the other with a little ingenuity, and there are many who believe that its real superiority will bring it back again, even if not for some years to come.

# Make and Break Both Positive

New Idea in Timer Distributors Has Contacts Brought Together and Separated Independent of Spring Action—Very Rapid Operation Possible

**A** BREAKER mechanism for an ignition distributor in which both the make and the break are positive mechanical operations, neither depending upon the rapidity of action of the spring, is the briefest possible description of a new device recently evolved by the Pittsfield Spark Coil Co., Pittsfield, Mass.

Despite its unusual action the device is extremely simple and it is explained by the series of diagrams in Fig. 2. The essential feature is the use of the two stout spring steel pieces *A* and *B*. It will be noticed that each of these carries a contact point and that *A* is longer than *B*. The cam shown is square with rounded corners, but it would be, of course, hexagonal for a six-cylinder engine, octagonal for an eight, and so on.

Striking radii from the center of the cam and considering the three *R*, *R*<sub>1</sub> and *R*<sub>2</sub>, it is obvious that *R*<sub>1</sub> is the longest, while *R* and *R*<sub>2</sub> are of equal length.

As the corner of the cam sweeps past the free ends of the springs they will be lifted and, if the rotation is in the direction of the arrow, *B* will begin the lift first, while *A* will lift a trifle later. In the middle diagram of Fig. 2, the parts are shown in the position where the end of *B* is just in contact with the end of the radius line *R*<sub>1</sub>. At the same instant *D*, the extremity of *A*, will be in contact with the cam at the end of the radius *R*. This means that with the cam in this position *B* has been lifted to the highest point which it will attain, while *A* still

has some short distance upward to travel as the cam turns further around.

The clearances are so arranged that the amount of advance lift given to *B* is just sufficient to raise it until the platinum contacts meet. In other words, *D* is lifted out of contact with the cam just a hair's breadth when *B* is at its extreme limit of travel.

If the cam goes on turning it is obvious that *B* will fall again by the action of the spring, which would break the points apart, but this is not relied upon, as the spring cannot act quickly enough. Suppose *B* remains suspended in the air after the corner of the cam has passed on;

that the spring only acts quite slowly. Now turn back to the middle diagram of Fig. 2 and consider *D*, the end of blade *A*. As soon as the cam turns into the position shown in the right-hand diagram of Fig. 2, *D* must be lifted, and blade *A* will thus be raised so high that the contacts will separate even if *B* has not adhered

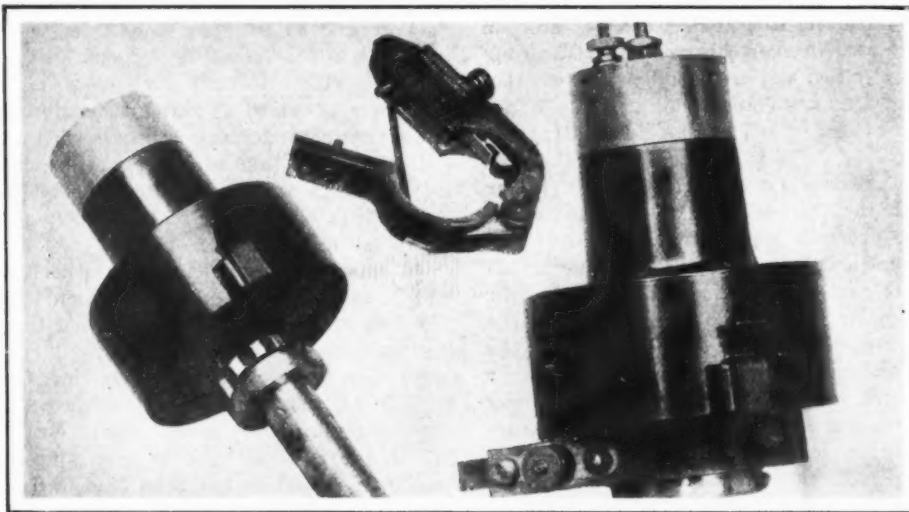


Fig. 1—Pittsfield distributor complete and with the breaker mechanism removed, the method by which the breaker box comes off is obvious. The coil is contained in the upper part of the body which is stationary, only the breaker moving to give advance

to the cam because of sluggish spring action.

Putting this another way, in Fig. 1, first position, both *A* and *B* are resting on the side of the cam and the platinum points are not in contact. As the cam turns it first lifts *B*, bringing the points together. This causes *A* to be lifted, thus keeping the contacts together with a firm pressure. Immediately the point of the cam strikes *D* the circuit is broken,

(Concluded on page 191)

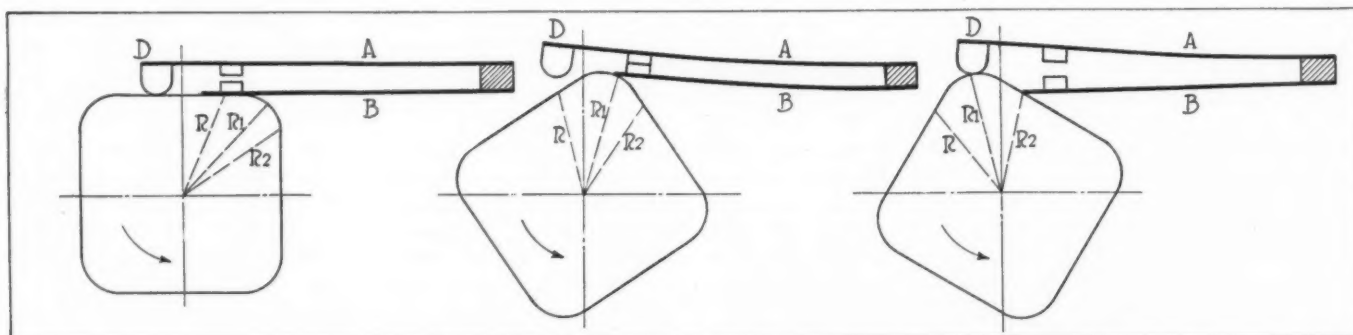


Fig. 2—Exaggerated diagrams showing the three stages of action in the breaker mechanism of the Pittsfield distributor for battery ignition



# Haynes Light Twelve in Production



Rear view of the twelve-cylinder engine used in the Haynes Light Twelve. It is 2 $\frac{3}{4}$  by 5 in. and has a piston displacement of 356 cu. in.

**A**LTHOUGH the Haynes twelve-cylinder motor was exhibited at the New York show and elsewhere on the circuit last January, production on a complete twelve-cylinder car has not been started until the present time. In producing this model, which has been given the title of the Light Twelve, the Haynes company has combined two existing units, the twelve-cylinder engine and the chassis used for the six-cylinder model, which has been continued without change.

Greatly increased floorspace, due to the addition of several new buildings, has increased the facilities of the plant to such an extent that the demand for the six can now be taken care of and the twelve also manufactured. The fact that the two power plants are interchangeable has also enabled the manufacturers to unify their production scheme to such an extent that all that is necessary in the way of more room is that required for the manufacture of the engine. Even the bodies of the two cars are similar.

In the design of the twelve-cylinder engine every attention has been paid to maintaining lightness. Throughout, all the requirements of high-speed motor design have been followed with particular attention being given to light reciprocating parts and ability to accelerate. The cylinders are cast in two sets of six and are of valve-in-head construction with removable cylinder heads. As required by twelve-cylinder timing, the two blocks are set at an angle of 60 deg. on the base. A piston displacement of 356 cu. in. is given by the twelve 2 $\frac{3}{4}$  by 5 in. cylinders. This gives a formula horsepower rating of 36.3.

## Pistons Are Aluminum

In manufacture each of the cylinders are ground separately after the completion of the boring operation. The pistons are aluminum and this fact coupled with the small bore gives a very light stress on the bearings in transmitting the forces of the explosion strokes. Three patented rings are used on each piston and in addition there is an oil groove to prevent the flooding of the combustion chamber.

Owing to the light stresses due to the moderate bore and



Front view of five-passenger Haynes, showing caster-type front axle

2 $\frac{3}{4}$  by 5-In. V-Power  
Plant Is  
Interchangeable  
with  
Six-Cylinder  
in  
One Chassis—  
Six Is  
Continued Without  
Change

light reciprocating parts, it has been found practicable to use a side-by-side connecting-rod construction. With this arrangement the right set of cylinders is moved back the width of a connecting-rod bearing toward the cowl, thus giving an offset or staggered arrangement to simplify the lower rod construction. The same type of crankshaft is used on the twelve as on the six. This is a three-bearing shaft drop forged from 0.40 to 0.50 carbon steel subjected to heat treatment and carefully balanced.

## Valves Overhead

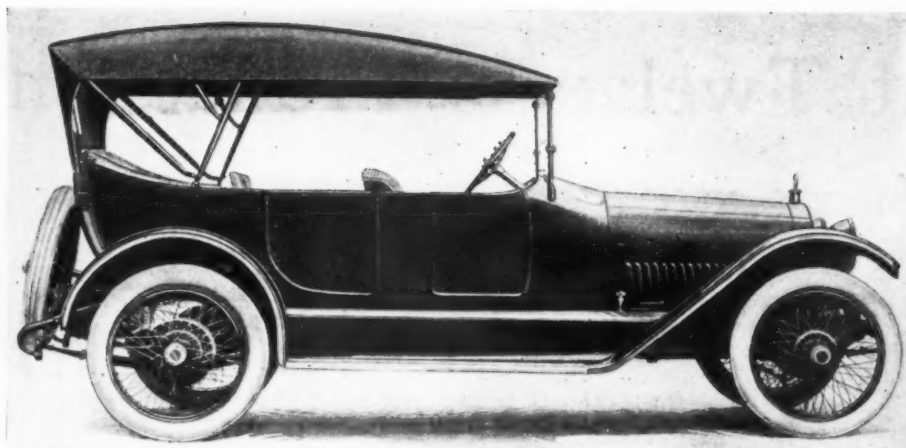
In working out the valve arrangement the overhead position has been selected, due to its accessibility and also for the advantages of combustion

chamber shape. With the valves carried in the head the intake manifold is short and the exhaust is on the outside with the pipe at the center of the manifold. Thus the exhaust gases are carried straight down and back under the car at a sufficient distance from the driver's compartment to obviate the possibility of the heat entering the body. Another advantage gained by this arrangement is the neat layout of accessories permitted. The carburetor is hung from the short manifold in the center of the V in such a high position that it is quite convenient on lifting the hood. The ignition apparatus consisting of the timer and distributor is also mounted between the V and the water pump, generator and air pump are all accessibly mounted along the side of the engine and can readily be reached or even removed without interfering with any other parts.

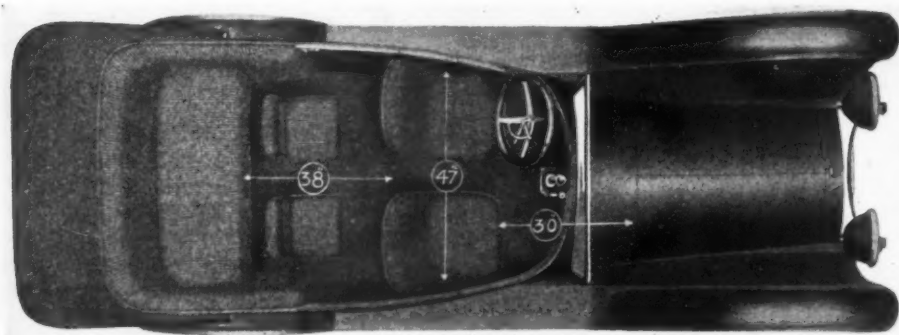
None of the parts of the valve action is in any way interfered with by the accessory mountings. The camshaft is placed at the center line so that the valves for both cylinders are driven off a single shaft. The valves are placed in the removable head and adjustments are readily accessible.

## Pressure-Feed Oiling

Lubrication is by pressure feed, the lubricant being circulated by the gear pump through the hollow crankshaft. From this shaft there are outlets into all the bearings and those which are not reached by the crankshaft leads are fed



Haynes Light Twelve seven-passenger touring car which, with complete equipment, sells for \$1,985. Wire wheels are regular fittings on this car. Goodyear 34 by 4½-in. tires are used



Plan view of the seven-passenger Haynes touring car, showing the seating arrangement and giving an idea of the liberal body dimensions, insuring comfort to driver and passengers

by small oil pipes. There is an indicator on the cowl which informs the driver of the condition of the lubricating system and of the pressure under which the oil is being fed.

Electrically the Haynes twelve is very much the same as the six. The Leece-Neville starting and lighting system is employed, while for ignition there is a double Delco distributor mounted as described. In the starting and lighting system the motor and generator are in separate units with a Bendix gear attachment for the starting motor which engages the flywheel. The generator is mounted on the same shaft which carried the water pump on the right side of the engine. A feature of the system is the use of an automatic circuit breaker which takes the place of fuses. As soon as a short circuit occurs on the line the circuit breaker opens, and after the trouble is remedied, the circuit breaker can be again closed by simply pressing a button. Gasoline is fed by the Stewart vacuum tank which is mounted in the V on the twelve.

On both the twelve and the six a three-plate-dry-disk clutch is used completely inclosed in the flywheel housing. It can be adjusted by the removal of a cover plate which incloses the mechanism so that it cannot be reached by water or dirt. A lining of Raybestos is mounted on a floating member to clean the plates of the clutch and this member takes all the wear. No oil is used on the friction surfaces of this clutch, so that it requires little attention, but when adjustments are necessary they can be made by lifting the floorboard of the front compartment, removing the cover plate and

turning the two adjusting bolts. It is stated that adjustment can be made on this clutch in from 5 to 10 min.

From the clutch the power is transmitted to a three-speed selective gearbox, the gears in which are cut from drop forged nickel steel blanks and the shafts are also of nickel steel and are carried on large Gurney ball bearings. As is customary in unit power plants the shifter mechanism is all mounted in the cover plate. A ball-topped shifter rod is used pivoted at the floorboard line by a ball and socket joint.

#### Axle Is Floating

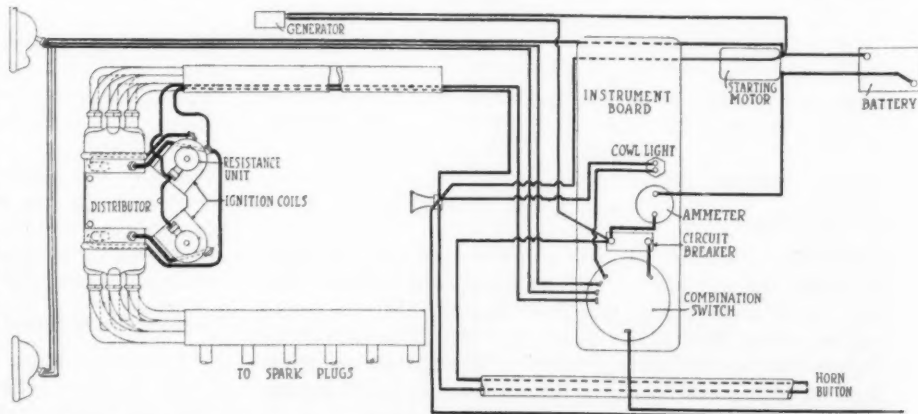
Two universal joints are used in the drive, one being mounted at each end of the propeller shaft. The rear axle is floating and is a design which is manufactured entirely in the Haynes plant. Although the shafts do not carry any of the car weight, but only transmit the driving torque, they are of large dimensions, being 1½ in. in diameter and of heat-treated nickel steel. Spiral bevel drive gears are used with the pinion gear and shaft also of heat-treated nickel steel. A feature of the rear axle is that the entire differential can be removed by taking out four nuts that retain the bearings. This can be done without removing the axle. There are also adjustments in any direction for mesh between the driving pinion gear and the

large ring gear on the differential.

Both service and emergency brakes are expanding and are set side by side on the inside of a 14-in. drum. With this arrangement they are both completely inclosed and protected from mud. The brakes may be taken up from the outside to compensate for wear of the shoes.

On the twelve, wire wheels will be part of the regular equipment. The tires are Goodyear cord 34 by 4½. The front axle is an I-beam, inclined to give a caster action to the wheels. The wheel spindles and steering knuckles are heat-treated, drop forgings of nickel steel. The front wheels run on two sets of bearings, one set containing ⅝-in. in the other ¾-in. balls. Both of these ball bearings are arranged to have a thrust or axial component as well as radial.

In equipment the twelve-cylinder cars are complete, being fitted with all the attachments customary on the up-to-date

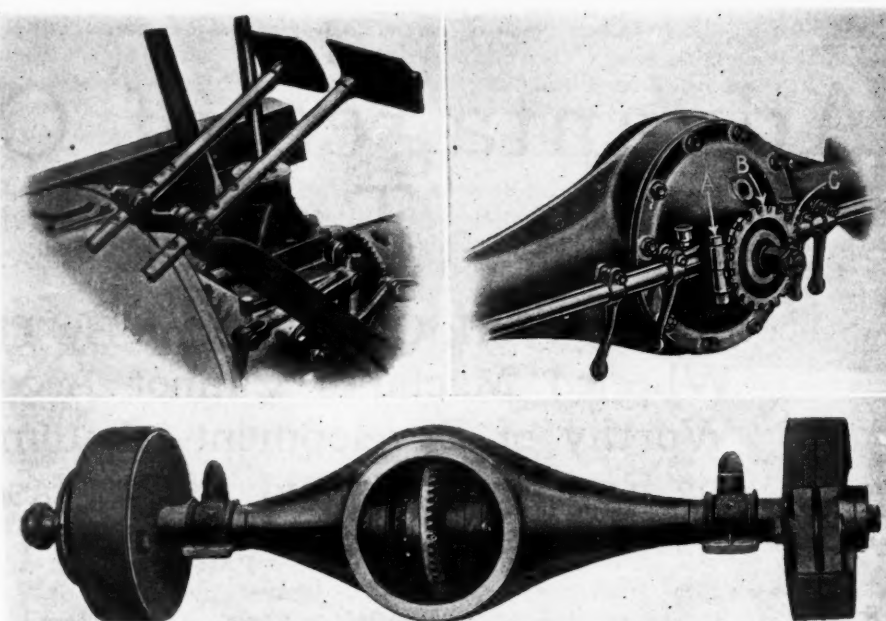


Wiring diagram of the Haynes chassis for 1917, showing the connections for ignition, starting, lighting, etc.



car. In regard to convertible bodies or demountable tops, either the Haynes twelve or six can be so fitted in a short time. These tops are known under the trade name of De Luxe and are made up in both demountable sedan and coupé styles. The interiors are trimmed in gray whipcord. The back and side tonneau windows are fitted with roll silk curtains and there is an electric dome light. The frame work of these bodies is made up of hard wood and the side panels and door frames are of ridged 2-in. stock. On the touring models the forward side panel is curved with the body line and  $\frac{1}{4}$ -in. polished bent glass is used in the windows. The demountable sedan tops for the five and seven-passenger touring cars and the coupé top for the roadster models are priced at \$275.

Regular body styles for the twelve-cylinder model are five and seven-passenger touring cars and the three-passenger roadster. On the touring bodies there is an aisle between the front seats, and both these front seats are adjustable forward and back. The roadster is a clover-leaf with three individual seats and the center seat set directly back between the front seats. The wheelbases with these bodies vary, for the five-passenger touring car and three-passenger roadster it is 121 in. and for the seven-passenger touring car 127 in. The price for the five and seven-passen-



A few details of the Haynes chassis, the illustration at the upper left showing the arrangement of the pedals, that at the upper right the differential pinion engagement and the one below depicting the floating rear axle which is made in the Haynes shops

ger cars and roadster is \$1,985. This figure includes motor-driven tire pump, complete body equipment, full lamp equipment, horn, tools, wire wheels on the twelve and a Boyce Moto-Meter. The standard colors are Brewster green with black running gear and the finish of the car is of a high order of merit.

## Boat Type Body on Mitchell Chassis

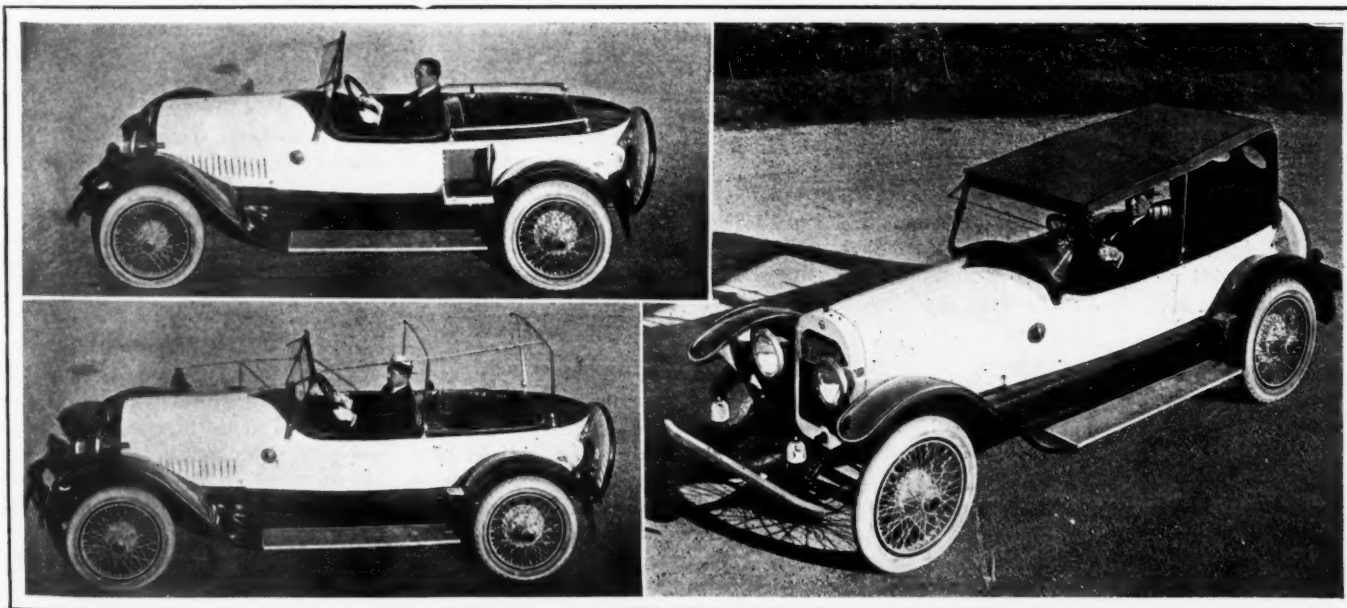
A BOAT body of unusual ingenuity has been designed by J. A. Clark of the Carl H. Page Co. for a Mitchell chassis. The car was designed for the use of Mr. Page and will seat six passengers and a child. The lines follow those used in launch work, and the finish is in white enamel for the body with the upholstery and running gear of the same shade of green. Wheels are Houk wire.

Ordinarily the car is adaptable for four adult passengers, the rear and front seats holding two apiece. In addition

there are two concealed seats which let down from the sides of the body. There is also a child's folding seat in the forward compartment.

The top is invisible when it is not in use, and the bows which support it are folded down and are similar to the deck rails on the side of a boat. The top can be used as a sunshade, without the side curtains if desired.

Another ingenious feature is the single door entrance. A door back to the front seat, giving access to the rear.



The disappearing top is one of the features of this special body design, which is mounted on a Mitchell chassis

# Advantages of Caterpillar Tractors

Special Work Can Be Done By This Type Which Wheeled Machines Cannot Accomplish — Type Worthy of Development—Automobile Engineering Experience Would Effect Vast Improvements

## PART I

THE earliest systems of mechanical traction on a commercial scale were all steam operated, because at the time the steam engine was the only motive power which had been developed to a reasonable state of efficiency. Early types of road locomotives, both as tractors and steam wagons, were developed, principally in England, which country carried out the exploitation of the road steam engine to a far greater extent than one is able to find in other countries. Such a power unit was inherently cumbered by a large mass of metal, constituting the boiler and tanks, which caused its weight to grow out of proportion to its power production. In other words, the weight per horsepower of the steam-traction engine, fully loaded with fuel and water and ready to run, soon became of such proportions that its possibility as a commercial article was limited by reason of the conditions of roads and bridges. Some years ago it was obvious to the student of locomotion that such a type of tractor was doomed, except in a few special cases, and these are principally concerned with the question of fuel supply. It is a notorious fact that the steam-traction engine and the steam wagon will operate at a very low fuel cost as compared with other types of machines doing a similar class of work. On the other hand the steam-power unit requires considerably more attention and suffers from stand-by losses, which latter are non-existent with the internal-combustion type of motor.

The fuel consumed by the steam tractor is of a bulky nature, and together with the water necessary for the boiler requires the services of three to five men and two to four horses for the haulage of supplies. The question of water becomes a serious one in a dry country, and there is also the delay in getting up steam pressure each day.

Against this the gas tractor can carry in its own tanks sufficient fuel and water for a day's run and one two-horse load of fuel will be sufficient for several days' working of the engine. Further, one operator cannot only attend to the tractor, but frequently is able to work the agricultural appliance as well.

### Weight Prohibits Steam

Although we are not at the moment concerned with a comparison between steam power and anything else, it has been necessary to make this slight digression in order to appreciate one important line of development which has been necessary as the power unit increased in weight. The large steam-traction engines made in England have a weight as high as 60,000 lb., which is principally carried on one pair of driving wheels. Such a weight as this is entirely unnecessary in the construction of any machine of the internal-combustion type built in accordance with modern practice and giving the

power output that is usually demanded from a single unit.

When we consider weight, two factors must be borne in mind. The first is the provision of a sufficient amount of material in the general structure of the machine to give it the necessary rigidity, and, second, such a weight must be provided on the driving means that sufficient adhesion is present under all ordinary conditions of working to transmit the maximum power of the engine through the lowest gear ratio without slip occurring between the ground surface and the surface of the driving means.

There is one other point of great importance that must also be remembered, and this is that the application of the weight of the machine to the surface must be carried out in such a manner that the intensity of local stress at the point of contact is reduced as far as possible. This statement also infers that the area of loading should be as large as possible. A round wheel theoretically makes line contact with a hard surface; in practice this line assimilates width and becomes an elongated rectangle. As the diameter of the wheel increases, so does the width of the rectangle, which fact has led builders of wheels to increase the diameter of the wheel in order to reduce the intensity of loading at the point of contact with the road.

### Advantages in Caterpillar Principle

Incidentally a wheel of larger diameter with its reduced intensity of loading causes a smaller depression upon a road as it rolls along, and is therefore easier to propel. Adding width to the wheel is another step in the general endeavor of the manufacturer of a round wheel to surmount many of the difficulties which are attendant upon the use of a wheeled tractor where the road surface is soft or rough. Wheels became of such colossal dimensions that the very largest machines were impracticable upon many of the roads and bridges provided for the accommodation of the ordinary traffic of the country, and other means were therefore sought to relieve the situation.

For many years past various firms engaged in the manufacture of agricultural appliances and engines for the propulsion of the same have been engaged in experimental work with a view to the development of some form of support for a heavy, self-propelled vehicle. Emulating the means provided by nature to the elephant, large sums of money were expended upon walking machines of the "pedrail" type. Theoretically such a system embodies many desirable features, as the loaded surface is directly applied to the road and its plane is parallel to the road the whole time. More than one loaded surface can be in contact with the road simultaneously and the area of contact can be anything



within reasonable limits. In such an appliance, the mechanical contrivance corresponding to the ankle was of some complexity and the whole system has been recently abandoned in favor of the continuous track system.

The necessity for some means of cultivating large tracts of unbroken prairie land in the western States of America was one of the reasons for the development of the caterpillar tractor. In such country, the ground is rough and covered with brushwood, and other serious obstacles to cultivation, requiring a considerable amount of power for their removal.

It is obvious that in the first place trees should be uprooted bodily and this work can be done by the direct pull of the caterpillar. This pulling power is obtained by reason of the high coefficient of traction of the caterpillar tread upon the ground, which is scarcely affected by the uneven contour. We know from experience that were a round wheel engine to attempt work of this nature, the result would be that the wheels would dig channels in the ground and the machine would bury itself up to its rear axle.

#### In Reclamation Work

Reclamation projects have almost entirely depended upon caterpillar power for their attainment and in the delta land of California, for example, no other machine but the caterpillar can be used on certain tracts. In these districts there are large areas of peat formation which have at one time been below the level of the water. This land has a very soft upper surface, so soft in fact that the foot sinks down in walking over it. There is not only this softness of the surface to contend with, but the whole ground is seared with fissures, so great in some instances that a man or a sheep can sink readily into one and disappear.

Even after some years of cultivation and continuous packing by the passing over the surface of agricultural implements and tractors, these fissures are still present to a considerable extent and it is impossible for horses to operate. True it is that some round wheel engines are used on parts of this land and also some round wheel harvesting machines, but in such cases the wheels are of colossal dimensions.

The large gas tractor has developed very slowly in Europe.

The cost of a volatile liquid fuel there almost precludes it from industrial application on a large scale, and it is only in countries where distillates from petroleum can be obtained at a comparatively low price that large internal combustion engines can prove attractive in competition with a coal-fired steam engine on the point of cost. We therefore find that it is in America that the large internal combustion power unit of the track-laying type has been the most fully developed. In this country we find a considerable number of firms making track-laying machines, all of which are very closely allied in general design, and it must therefore be assumed that the type of track and the method of rolling thereon have been proved to be the most satisfactory of the undoubtedly large number of experimental designs that have been tried out. From an impartial standpoint, the main characteristic of the track-laying machine is its apparent crudity as compared with the motor truck; a finely developed mechanical production, which is a vehicle of almost similar requirements. This characteristic is probably due to the fact that track-laying machines are generally made by firms who are engaged in the construction of agricultural implements and who have not been required to produce apparatus having that fine finish which is so necessary in automobile practice.

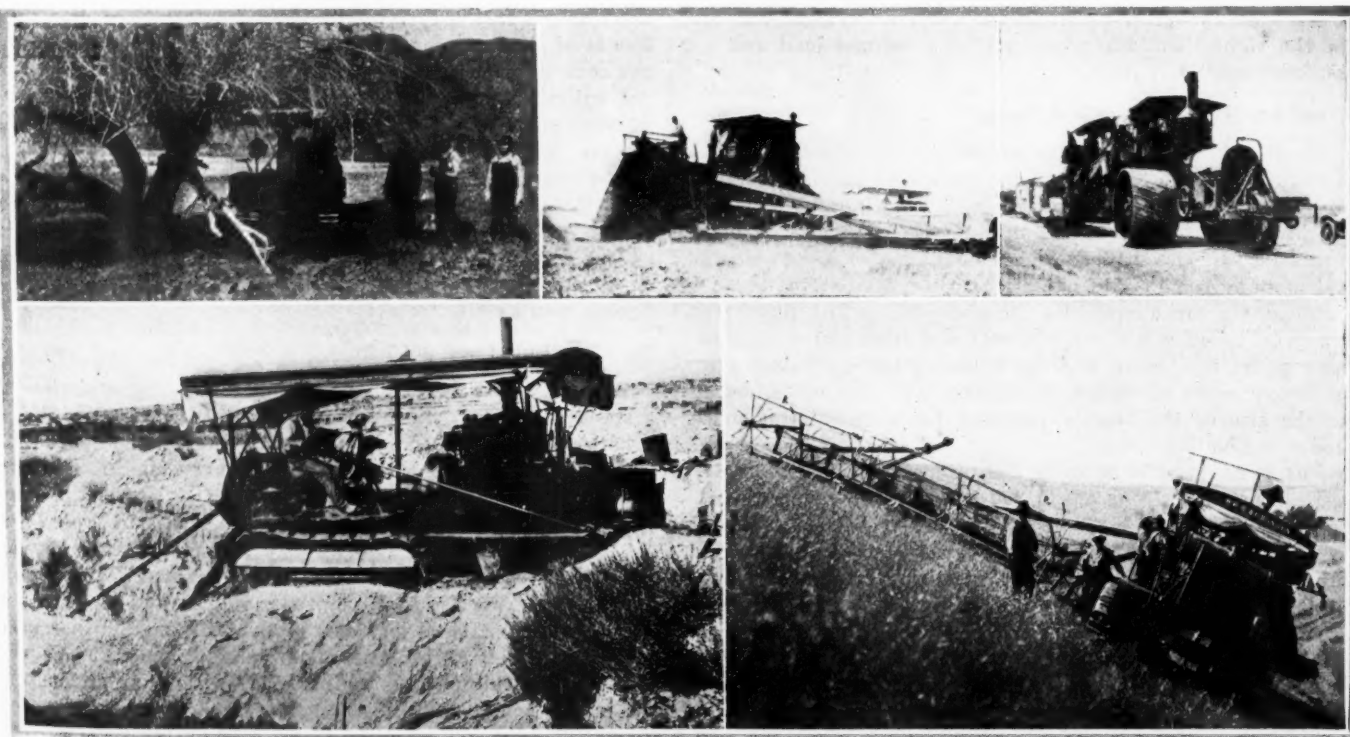
#### Special Abilities of the Caterpillar

In spite of this apparent crudity, there is no doubt that the best type of track-layer, such as the caterpillar, gives extraordinarily good service, and, in a word, whatever may be doubtful about it, it certainly does work easily, which no other type of machine can attempt. This shows that the caterpillar is in a class by itself, and it undoubtedly must be built to meet many extraordinary conditions in working, of which the layman is unaware.

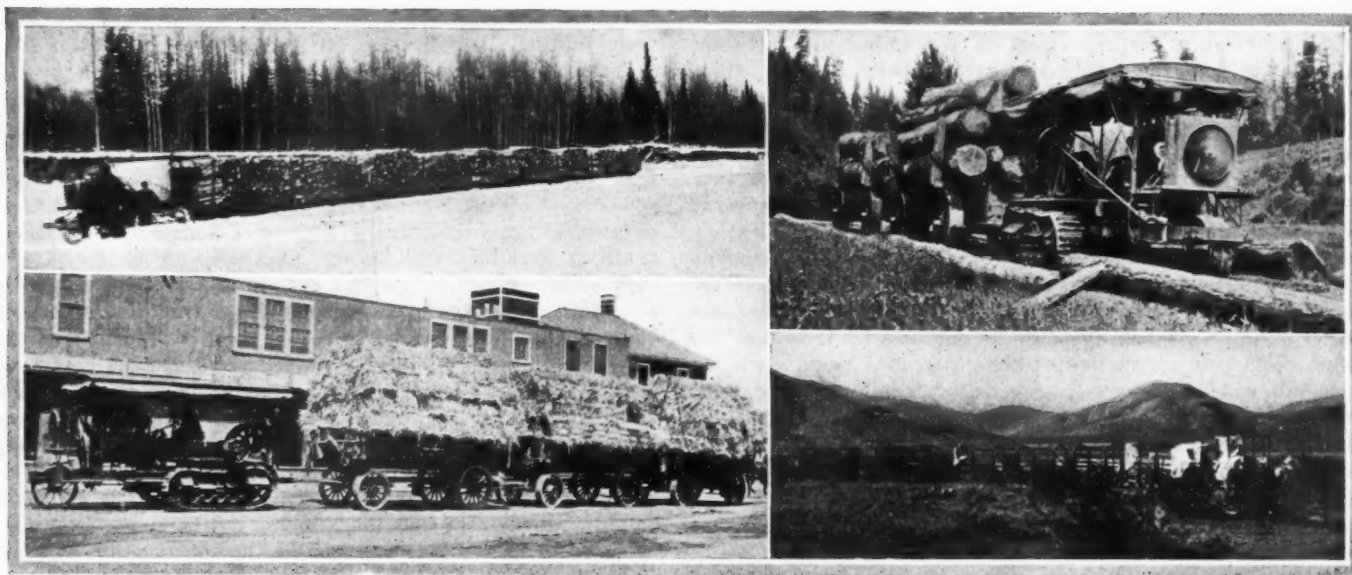
The caterpillar fully comprises the chief advantages of a tractor for farm work from the point of view of the operator, which are:

Ability to do heavy work rapidly, thus covering the desired acreage within the proper season.

The saving of manual labor.



Upper left—Caterpillar tractor uprooting tree by direct pull. Center—Caterpillar harvesting machine working in barley where the softness of the ground renders it impossible to use a round wheel. Right—Steam tractor, showing enormous wheels required. Lower left—Caterpillar tractor pumping for irrigation at Lovelock, Neb. Lower right—Use of the caterpillar in harvesting on a side hill



Upper left—Caterpillar tractor hauling fifty-two cords of timber at Fairbanks, Alaska. Right—Caterpillar used in logging. Lower left—Hauling hay in California. Right—Use in hauling equipment and material for a water development in Los Angeles, Cal.

The ability to plow to a good depth, especially in hot weather, but it does not suffer from the great disadvantage of other tractors, namely, the packing of the soil when damp.

There is one other disadvantage cited against tractors for farm work and that is the difficulty of efficient operation, but in the caterpillar this is reduced to a minimum, and particularly in those types which can be turned around practically in their own length. Like any other machine, and particularly of the internal combustion type, where the power of the engine is limited, it is particularly necessary in choosing the size of a caterpillar that three factors be borne in mind:

1—A machine that will produce enough power to do the work in the best possible way.

2—That will produce enough power to do all the work at the time when it should be done.

3—With enough power to do the work in the right way and at the right time, and when pulling a normal load and not an overload.

#### Need for Data on Required Power

So far as agricultural requirements are concerned, it is almost impossible to obtain definite data of the drawbar pull necessary for the various appliances, in different soils and working at different depths in the case of plows. Certain firms are experimenting at the present time with the object of determining some of the conditions to be fulfilled by an agricultural tractor as regards drawbar pull. The purchaser, however, specifies his requirements and the number of plows he requires to operate, and the following table, obtained from the experiences of owners in Illinois, will give some idea as to the size of the tractor required for various sized areas under cultivation:

Farms having 200 acres or less of crops—a 3-plow tractor.

Farms having from 200 to 300 acres—a 4-plow tractor.

Farms having from 300 to 450 acres—a 4-plow or larger.

For 450 to 700 acres of crops, the 4-plow is given slight preference, although the 5- and 8-plow sizes are recommended by 22 per cent of owners.

A farm of 140 acres is the smallest upon which the smallest size tractor in common use may be expected to prove profitable.

#### Fuel Consumption 2½ Gal. per Mile

It must not be supposed that the purchase of a caterpillar will lower the working cost of any farm, but its pur-

chase must be justified by increased returns. No matter what be the size of the machine, a general average may be taken of fuel consumption at the rate of 2½ gal. of gasoline and 1/5th of a gallon of lubricating oil per one acre of ground plowed 7 in. deep. This figure will, of course, vary with the working conditions and with the skill of the operator, as obviously the fuel consumption will be approximately proportional to the load on the engine when a good carburetor is used. This is indicated by the following general figures for the fuel consumption of a 75 hp. caterpillar engine, which at full load has a rate of fuel consumption of 0.63 to 0.66 lb. per hour; at half load 0.75 to 0.80 lb. per b.h.p. hour; and at quarter load 0.9 to 1.1 lb. per b.h.p. hour.

The caterpillar, like other apparatus of a somewhat novel type, has of necessity some drawback, and in this instance it is that of loss of power in the transmission system and in the tracks. In the case of the largest caterpillars, this total loss is of the order of 42 per cent on the direct gear and 48 per cent to 53 per cent on the high gear. This total loss is not entirely frictional, but it includes possibly as much as 10 per cent of the b.h.p. of the engine, which is to be held in reserve to overcome sudden emergencies. If the drawbar is too heavily loaded and a rough spot is met on the road there is otherwise no means of meeting the sudden demand for an increase of power, as the engine is controlled by a governor of a somewhat slow acting type. As an indication of the tractive power of a 75 hp. caterpillar, the following figures may be of interest:

#### Drawbar Pull Over 8000 lb.

With the direct gear in operation in the transmission at a speed of 2.01 m.p.h., the drawbar pull was 8500 lb., giving a horsepower on the drawbar of 45.9. When the speed was increased to 2.07 m.p.h. by running the engine slightly faster, the drawbar pull was reduced to 8200 lb. and the drawbar horsepower to 45.3. The road speed of the caterpillar is limited to about 3½ m.p.h., principally by reason of frictional loss as the speed increases above this figure, and tests have shown that, whereas at a speed of 2 m.p.h. the frictional loss amounts to 13 hp., this increases to approximately 20 hp. at 3 m.p.h., and 27 hp. at 3½ m.p.h. For agricultural purposes a direct geared machine at 2 m.p.h. is working under the most advantageous conditions, but for road haulage it is convenient to gear up on the indirect.

The 60-hp. caterpillar is a similar type to the 75-hp., but having an engine of half an inch smaller bore gives a draw-



bar horsepower of 38 at a road speed of 2.2 m.p.h., producing a mean pull of 6500 lb. An equal mean pull is obtained by the 45-hp. machine when running at a speed of 1.47 m.p.h., and under these conditions the drawbar horsepower is 25.6. With the same machine running in the direct high gear at a speed of 2.1 m.p.h., the drawbar horsepower is 28 and the pull 5000 lb. These average figures for drawbar pull are between the limits of about 1000 lb. on either side, as in actual working there is considerable vibration and variation due to the loading.

Let us for a moment look at the work which such a machine is called upon to do in actual usage, and consider why caterpillar traction is not only advisable but practically imperative when full return is required from an initial capital outlay:

#### Effect of Deep Plow on Harvest

Definite experiments have shown that by increasing the depth of plowing from 3 in., which is common practice, to 7 in., the yield on a 3 years' average increased to the extent of 6.33 bushels per acre. Experiments made by the University of Wisconsin show that to double the depth of plowing requires an increase of 70 per cent in power.

President J. H. Worst of the North Dakota College of Agriculture says: "It requires approximately \$7 per acre to grow a crop. By adding an additional dollar's worth of labor to each acre there is little question but that the average profit will be doubled. In other words, as much profit should be realized from one additional dollar's worth of labor as is now realized from \$7 worth of unavoidable labor and investment."

It might seem that the investment in a tractor only working for less than one-third of the total number of days in the year, might be unprofitable. Let us see:

Taking a four-plow machine which works on an average of 60 days per annum, the estimated average life of this machine is 510 days, while with a larger tractor, say a six-plow machine, working 70 days per annum, its average life is 735 days. These figures will appear low at the first glance, but it must be remembered that when horses are

employed they are only occupied about 100 days per annum doing farm work, so that when both horses and tractor are used, even though the number of horses is reduced, the tractor will not have employment for so many days per annum as did the horses.

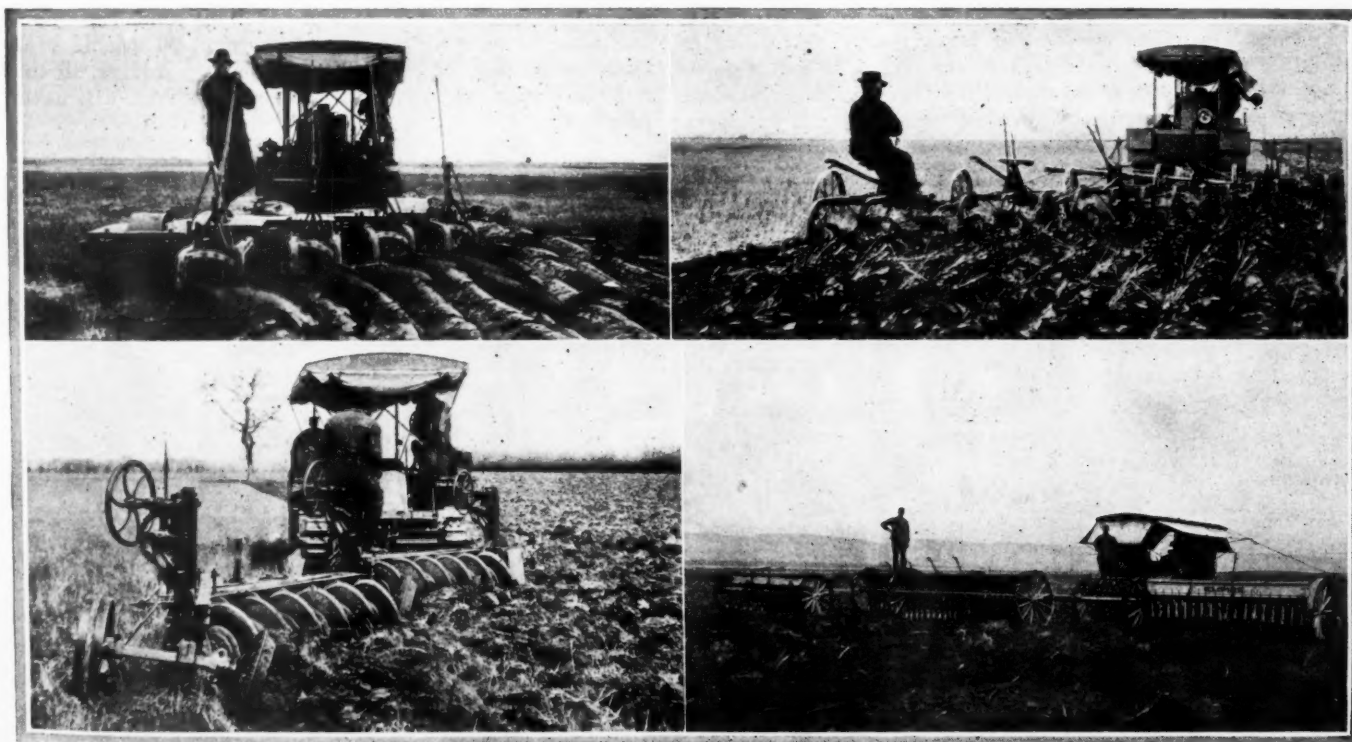
A 60-hp. caterpillar purchased in 1912, doing farm work, in 1914 harvested 3200 acres, in 1915 2200 acres, also plowing for beets 12 to 14 in. deep in grain stubble that had never been plowed before, and pulling four 14-in. Killifer plows. The price paid for this plowing is \$4 per acre, and this particular machine has been in almost continuous use for 45 months and has plowed 9000 acres, disked 12,000 and harvested 10,000, besides doing miscellaneous work. During its life it must have traveled at least 18,000 miles.

Herewith are illustrated various types of caterpillars performing this class of work and, generalizing on the impression to be gained from the inspection, one cannot help being impressed by the width of the strip which is under cultivation behind the caterpillar. Naturally this width must vary in accordance with the implement hauled and with the nature of the ground in which it is working and as this may present such a number of different conditions, it is quite impossible to give any definite figures with regard to the number of plows, for example, that any type of caterpillar will haul.

#### Disadvantages of Round Wheels

It may be contended that a round wheel machine can do similar work and this is quite true in a measure and under certain conditions. The contention, however, is that a round wheel engine, by reason of its intensity of loading, leaves wheel tracks which show up particularly when harrowing as the harrows do not obliterate these tracks. The result is that the grain will show up in uneven rows at harvest time and such grain as has been planted in the tracks will not mature to the same extent as the rest of the field. The intensity of loading on the caterpillar track does not exceed 7 lb. per sq. in. and can be reduced to half that pressure if necessary by fitting wider tracks.

(To be concluded)



Upper left—Caterpillar tractor hauling an eight-bottom plow. Note the deep furrows. Right—Another application with a gang plow. Lower left—Caterpillar tractor hauling a disk plow. Right—Use in pulverizing and disking ground

# Martin Aviation Engine Unique Design

Special Cylinder Construction and Very Accurate Workmanship Give Light Weight—Design Is Very Compact

**T**HAT the aviation engine has now to be a very different kind of product from the conventional automobile motor, even of the highest quality, is an accepted fact. To obtain the ability to stand up to as severe stresses as a racing car engine and to hold up for many hours of continuous service a class of workmanship is required which would be absurd in an automobile engine. Cost, at least as long as governments are the principal buyers, is of little moment.

Of all the special requirements of the aviation engine that of ability to stand up is the most difficult to meet, and it can only be met, in conjunction with light weight per horsepower, by the use of exceptionally strong materials. One of the most troublesome parts of an engine in which to combine strength and lightness is the cylinder, as this has to do many things besides sustaining the combustion pressure, and the cylinder construction is quite one of the most striking features of the Martin engine. This motor is made by the Griffith Machine Works, Los Angeles, Cal., and is designed by Glen H. Martin in conjunction with E. C. Griffith and Caleb Bragg. It is an eight-cylinder V job with the cylinders at 90 deg., using the forked type of connecting-rod assembly.

## Built-up Steel Cylinders

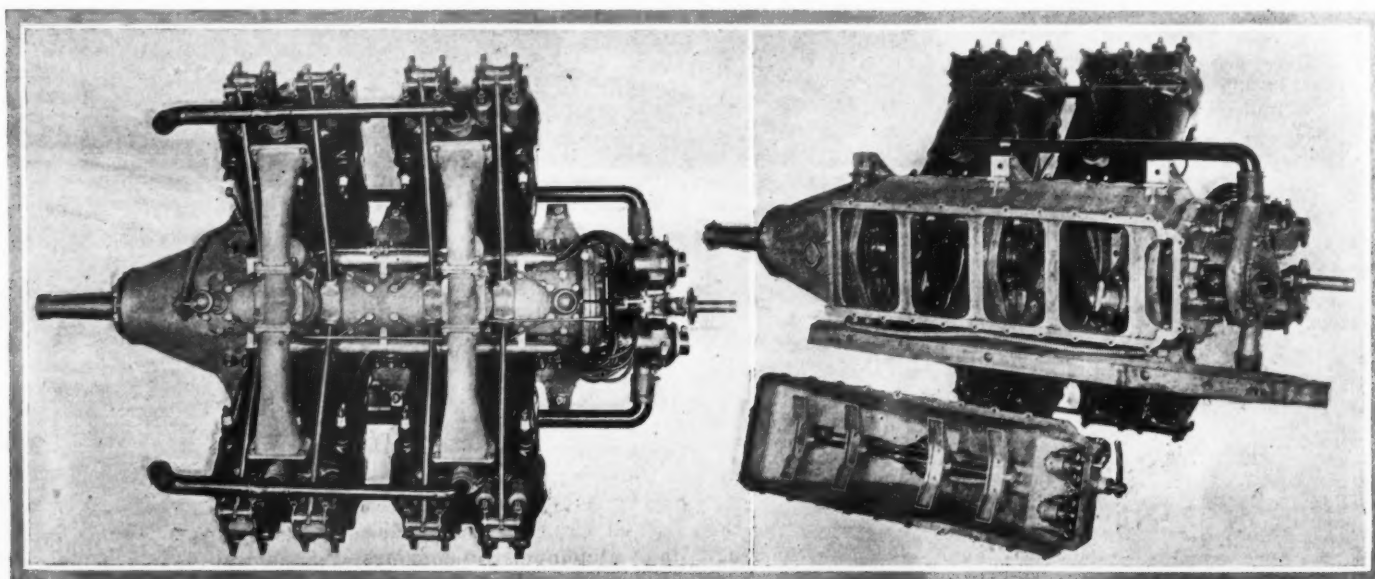
However, to return to the cylinders, these are all steel and something like the Mercedes type. That is there are several parts of steel welded together. A difference occurs in the extent of this welding, for the Martin engine cylinder is built up from more pieces. The cylinder wall and the head, where the valves seat, are both machined all over to an even thickness, there is no more metal just back of the valve seats than anywhere else, thus the cooling is as nearly perfect as it could be made. Next, the jackets are stamped from a quite large number of bits of sheet steel the junctions being welded. The work is so neat that the pairs, into which the cylinders

are formed by the jackets, look like very high grade castings, and the economy of metal is shown by the weight of the cylinder being only 24 lb., despite a bore of 4 7/8 in. and stroke of 7 in.

## Push and Pull Valve Action

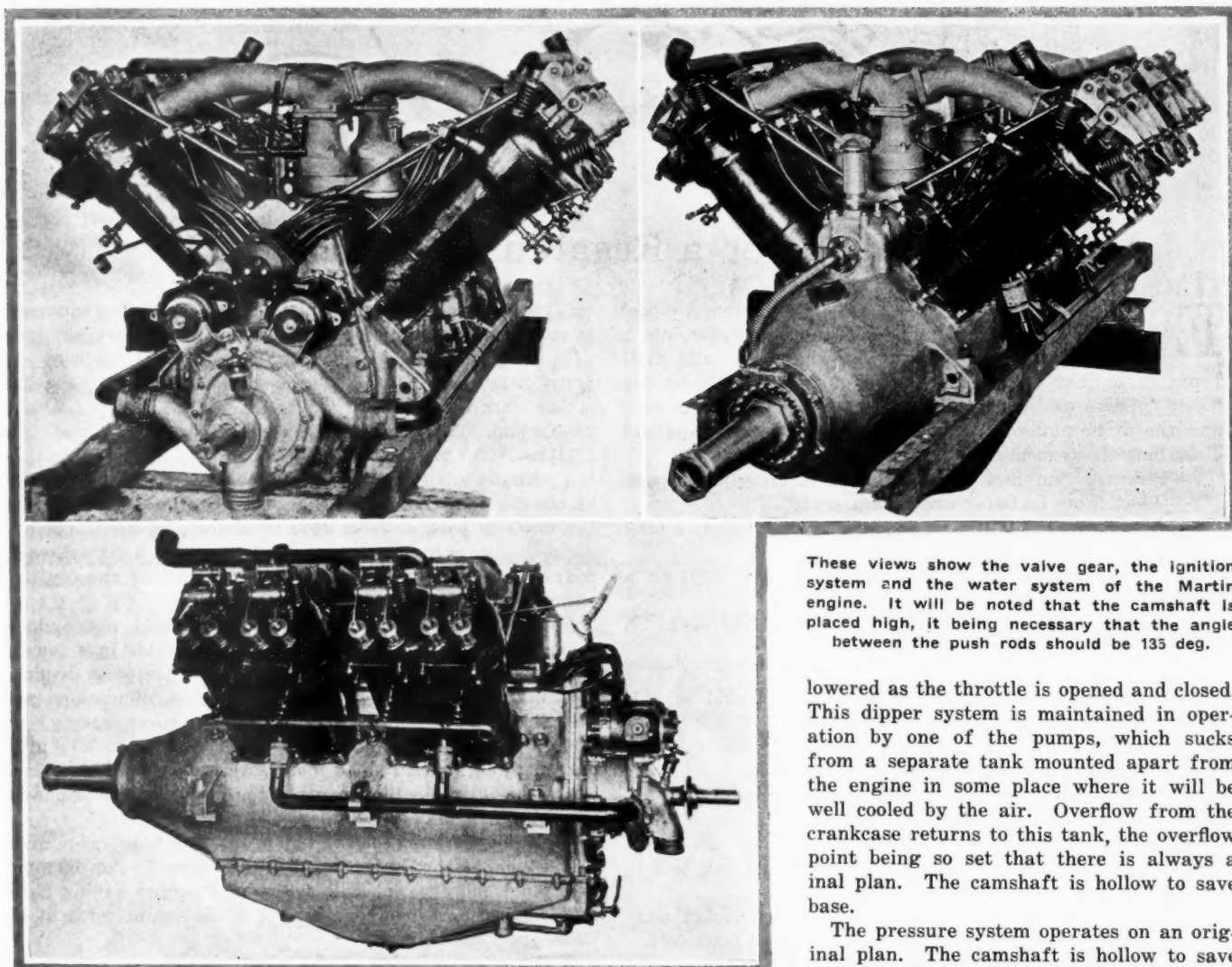
The valve operation is unusual as can be seen from the illustrations. Double ended rockers swing on pivots placed above the cylinders and linked to the camshaft by a single steel tube. The cams are duplex and the tappet is of stirrup form, so that the camshaft first pulls the operating rod, so opening the two intake valves, and then the second cam pushes the rod upward, thereby depressing the pair of exhaust valves. This design calls for very careful workmanship, but granted this, it eliminates a number of parts and so saves weight. It will be noticed that the double cam takes care of all the inertia forces in the push rod and tappet piece, all that the valve springs have to do is to close the valves themselves.

Using one push rod for both valves and one pair of cams for opposite cylinders necessitates a high mounting for the camshaft. Since the pistons are operating with 90 deg. between each two of a V pair, and since the camshaft runs at half the crankshaft speed, it moves through only 45 deg., while the crank is covering 90 deg. If the engine is running clockwise the right hand piston will be going up on the exhaust stroke when the left hand piston is at the top of the compression stroke. At this moment the left hand intake valve will have been closed for 180 deg. of crankshaft or 90 deg. of camshaft movement and the right hand intake valve will have to open at the end of the next 90 deg. of crankshaft or 45 deg. of camshaft movement. Adding 90 to 45 it follows that the angle between the push rods will have to be 135 deg.



Plan and base views of Martin aviation engine, showing the tubular valve operating rods, the dip troughs which move in conjunction with the carburetor throttles and the great rigidity of the crankcase construction





These views show the valve gear, the ignition system and the water system of the Martin engine. It will be noted that the camshaft is placed high, it being necessary that the angle between the push rods should be 135 deg.

The rigidity of the crankcase can be appreciated from the view taken with the oil container removed. As can be seen, it is webbed strongly, the crankshaft and all the bearings being introduced from the rear end. Stiffness in the case is especially necessary in aircraft motors, because of the considerable twisting stresses arising from the propeller. If there is too little rigidity in the "nose" of the crankcase, and insufficient stiffness behind the nose in the body of the engine, the propeller can sometimes set up a weave which will result in a broken crankshaft. As shedding a little light on this matter it may be mentioned that unexpected trouble with the thrust bearings back of the propeller has been quite usual in aircraft engines, and investigation has shown the gyroscopic action of the propeller can, under some circumstances of flight, set up stresses of remarkable magnitude.

The Martin engine does not use a geared head, but mounts the propeller on a shaft which is an extension of the crankshaft to which it is bolted. This means that the motor is not intended to run at a very high speed as speeds go in automobile work. On a government test at Washington the peak of the power curve appeared at 1326 r.p.m. when the power developed was 183 b.h.p. this corresponding to a piston speed of 1500 ft. per minute in round figures. The brake mean effective pressure for the 183 hp. is 116 lb. per square inch, a very high value.

Effective lubrication when operating at all angles in the air, has been another difficulty in aviation engine construction. In the Martin motor there are two oil pumps, one caring for a pressure system and the other for splash. Under each connecting-rod there is a dip trough which is raised and

lowered as the throttle is opened and closed. This dipper system is maintained in operation by one of the pumps, which sucks from a separate tank mounted apart from the engine in some place where it will be well cooled by the air. Overflow from the crankcase returns to this tank, the overflow point being so set that there is always a small plan. The camshaft is hollow to save base.

The pressure system operates on an original plan. The camshaft is hollow to save weight, and the space within is used as the main distributing pipe for the pressure oil. The pump delivers oil to one end of the camshaft and holes, registering with passages in the crankcase, carry the oil to the main crankshaft bearings and thence to the crankpins. Smaller holes give oil to the cylinders direct, and to the cams and tappet mechanism. On this oil system there is a throttle, connected to the carburetor control, so that both pressure oil and splash oil are fed in proportion to the demands.

#### Two Magnetos Used

On the rear end of the camshaft there is a special high-tension distributor which is duplex, sixteen wires coming from it to the two independent sets of spark plugs. On either side of this distributor is a magneto, driven by gearing at twice crankshaft speed, and either machine will run the engine satisfactorily, though an increase in power is shown on the dynamometer when both are operating together.

The water pump, which is a double-discharge type, is mounted on the end of the crankshaft just beneath the magnetos and gives a direct supply to each cylinder pair through pipes connecting at the lowest points in the jackets. Two carburetors are employed, mounted in the V.

It will be noticed that aluminum alloy is used in this engine to no greater extent than in a conventional automobile motor. The crankcase, being so rigid in form is of thin section and the steel cylinders are claimed to be lighter than if of aluminum. Pistons are aluminum alloy, of course, and are strongly ribbed beneath the heads. The motor has undergone severe tests for the United States navy, and also at the Automobile Club laboratory, with conspicuous success.



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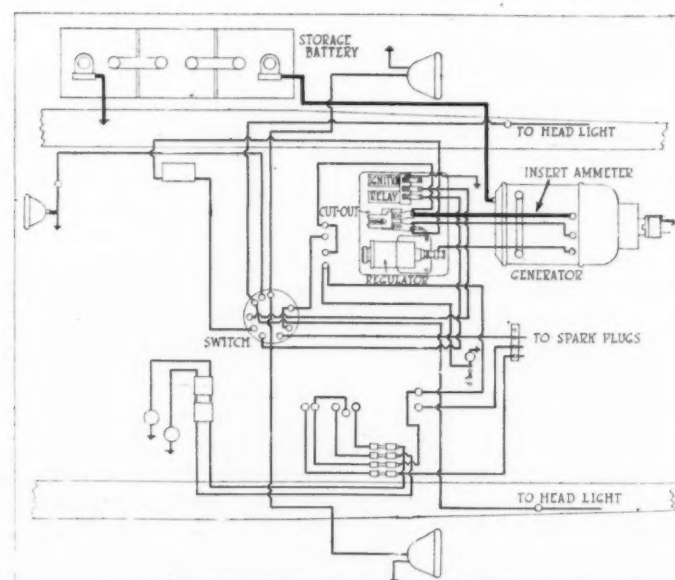


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2—The gear ratios are: First, 13.5 to 1; second, 6 to 1; third, 4 to 1; and Reverse, 17 to 1.

3—The car should be capable of about 50 m.p.h.

4—Breaker points of the Delco distributor should be set 0.0018 in. apart when opened.

5—There are two main adjustments of the needle valve A which controls the size of the needle, and an air adjustment B which controls the air. After the engine has started close the throttle to moderate speed, which means nearly closed. At this point close gasoline needle A a very little at a time until motor runs smoothly, allowing the engine to run until thoroughly warmed up before making final adjustments. The next step is to get proper adjustment of the air valve. To accomplish this, air valve adjusting screw B should be turned to the left to back out and release the air spring about one-eighth of a turn at a time until the engine begins to slow down. This indicates that the air valve spring is now a little too loose, whereupon it should again be tightened a little by turning to the right one-eighth of a turn at a time until the engine runs smoothly. Next advance the spark one-

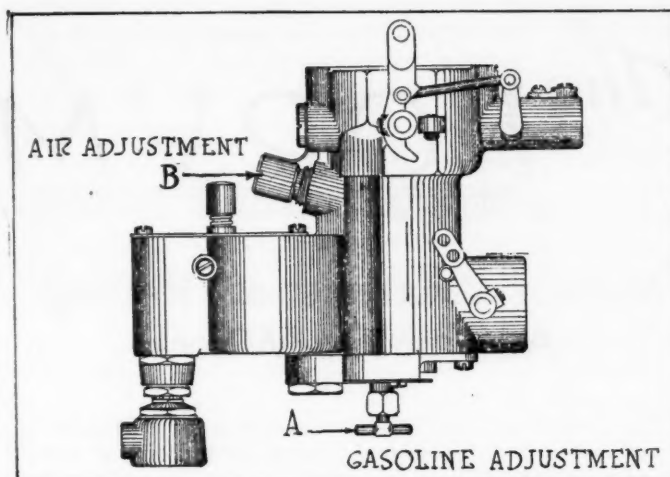


Fig. 2—Marvel carbureter used on the 1914 four-cylinder 35-hp. McLaughlin-Buick, showing points for adjusting the gasoline and air intakes

third of its entire travel. Now open the throttle quickly and as far as possible; upon doing this the motor should speed up promptly and quickly. If it hesitates, or popping back is heard a little more gas should be released at the needle valve A by turning to the left a very little at a time, and it may also be necessary to tighten the air screw a little more, but this should not be done unless absolutely needed. Wait for the engine to settle and again open the throttle quickly as before. Repeat these trials until the proper adjustment is obtained, the object being to have just enough gas to allow the engine to pick up promptly and smoothly when the throttle is suddenly opened, the spark, as mentioned before, being at about one-third of its advance or travel. The highest economy of fuel will be obtained by adjusting with the air screw B released to the left, and the gas valve A closed to the right, as nearly as possible to obtain the desired results.

6—When valve tappets are properly adjusted there should be a clearance of 0.005 in. between valve stems and rocker arms.

7—We would not advise installing an auxiliary air inlet except for racing purposes.

### Make and Break Both Positive

(Continued from page 180)

and thus the cam mechanically makes and immediately afterward mechanically breaks the circuit. Since both the make and break are made by the cam, both are equally positive, and the contact can neither fail to make nor fail to break and the strength of the springs does not affect the action.

Owing to the short duration of the contact, current consumption is small and the positive action is claimed to permit the distributor to operate perfectly at speeds in excess of the highest engine demands.

The whole distributing outfit is made up into single units 6 in. high by  $3\frac{1}{2}$  in. diameter. It includes the coil and condenser in symmetrical arrangement, so that the only external wire is a single lead to the battery in addition, of course, to the high tension leads to the spark plugs. The latter are stationary since the breaker box is moved independently of the cables. The distributor coil and condenser may be conveniently removed in one piece, uncovering the interrupter mechanism for adjustment and at the same time showing up a set of complete printed instructions for operating the same. The manufacturers are at present prepared to furnish this igniter for four, six or eight-cylinder engines, and they will shortly be in a position to supply a twelve-cylinder distributor.



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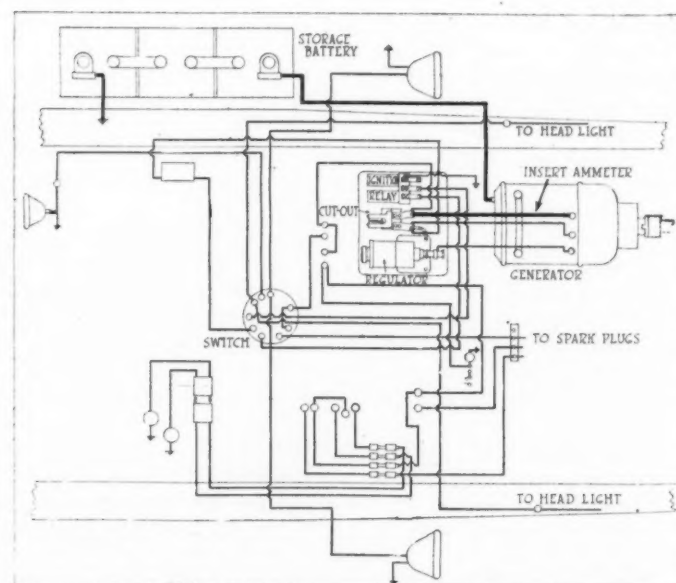


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Montreal, Que. A. L. H.

—The curves which you ask for are not obtainable.

2—The gear ratios are: First, 13.5 to 1; second, 6 to 1; third, 4 to 1; and Reverse, 17 to 1.

3—The car should be capable of about 50 m.p.h.

4—Breaker points of the Delco distributor should be set 0.0018 in. apart when opened.

5—There are two main adjustments of the needle valve A which controls the size of the needle, and an air adjustment B which controls the air. After the engine has started close the throttle to moderate speed, which means nearly closed. At this point close gasoline needle A a very little at a time until motor runs smoothly, allowing the engine to run until thoroughly warmed up before making final adjustments. The next step is to get proper adjustment of the air valve. To accomplish this, air valve adjusting screw B should be turned to the left to back out and release the air spring about one-eighth of a turn at a time until the engine begins to slow down. This indicates that the air valve spring is now a little too loose, whereupon it should again be tightened a little by turning to the right one-eighth of a turn at a time until the engine runs smoothly. Next advance the spark one-

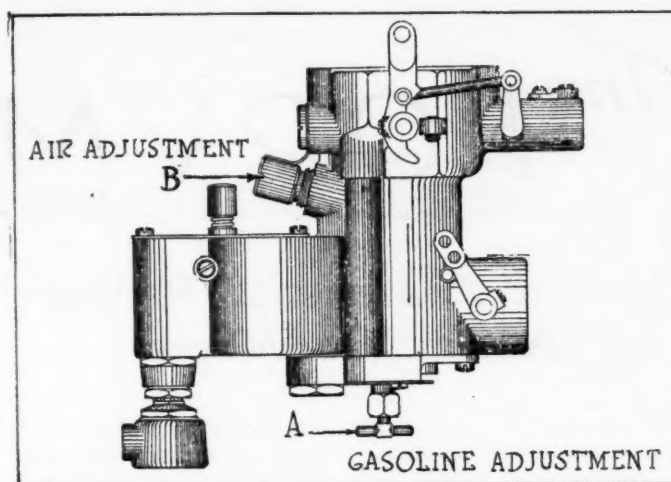


Fig. 2—Marvel carbureter used on the 1914 four-cylinder 35-hp. McLaughlin-Buick, showing points for adjusting the gasoline and air intakes

third of its entire travel. Now open the throttle quickly and as far as possible; upon doing this the motor should speed up promptly and quickly. If it hesitates, or popping back is heard a little more gas should be released at the needle valve A by turning to the left a very little at a time, and it may also be necessary to tighten the air screw a little more, but this should not be done unless absolutely needed. Wait for the engine to settle and again open the throttle quickly as before. Repeat these trials until the proper adjustment is obtained, the object being to have just enough gas to allow the engine to pick up promptly and smoothly when the throttle is suddenly opened, the spark, as mentioned before, being at about one-third of its advance or travel. The highest economy of fuel will be obtained by adjusting with the air screw B released to the left, and the gas valve A closed to the right, as nearly as possible to obtain the desired results.

6—When valve tappets are properly adjusted there should be a clearance of 0.005 in. between valve stems and rocker arms.

7—We would not advise installing an auxiliary air inlet except for racing purposes.

### Make and Break Both Positive

(Continued from page 180)

and thus the cam mechanically makes and immediately afterward mechanically breaks the circuit. Since both the make and break are made by the cam, both are equally positive, and the contact can neither fail to make nor fail to break and the strength of the springs does not affect the action.

Owing to the short duration of the contact, current consumption is small and the positive action is claimed to permit the distributor to operate perfectly at speeds in excess of the highest engine demands.

The whole distributing outfit is made up into single units 6 in. high by  $3\frac{1}{2}$  in. diameter. It includes the coil and condenser in symmetrical arrangement, so that the only external wire is a single lead to the battery in addition, of course, to the high tension leads to the spark plugs. The latter are stationary since the breaker box is moved independently of the cables. The distributor coil and condenser may be conveniently removed in one piece, uncovering the interrupter mechanism for adjustment and at the same time showing up a set of complete printed instructions for operating the same. The manufacturers are at present prepared to furnish this igniter for four, six or eight-cylinder engines, and they will shortly be in a position to supply a twelve-cylinder distributor.

# The FORVM

## Motion Analysis of Rolling Automobile Wheel

By C. V.

THE analysis of the rolling motion of a wheel brings forth several interesting facts. Taking an automobile wheel as example, particularly instructive is the comparison between the revolving motion of the wheel around a stationary axis and its rolling motion on the ground, in relation with a moving axis.

Let us take a 36-in. automobile wheel rolling in a straight line, in a vertical plane, upon a smooth horizontal plane or ground. Let us suppose that the tire is sufficiently inflated so the total diameter  $d$  of the wheel remains constant. Referring to the diagrams in Fig. 1, point  $O$ , the wheel center, is also its axis. Starting from the point  $A$ , where the ground line  $AB$  is tangent with the diameter  $AE$ , let us give the wheel one complete revolution, that is, rolling the wheel till the point  $A$  again meets the ground at  $B$ . The axis  $O$  will have traveled a distance  $OO' = AB = d\pi = 3 \times 3.1416 = 9.4248$  ft., while the point  $A$  will have described, in a vertical plane, in the same time, a trajectory resembling the upper half of an irregular ellipse whose small diameter is  $2d = 2CD$  and large diameter equal to  $AB$  and also to  $d\pi$ .

Any point  $x$ , below center  $O$  will describe an irregular curve similar to  $xy$  (dotted curve) on line  $xy$ , the curve portion below the axis line  $OO'$  will be sharper than the one above  $OO'$ ; in fact, both curves will gradually flatten out for every point as we get nearer to  $O$ , where the dotted line will finally assume the shape of the straight line  $OO'$  which coincides with the line of axis travel. The sharpness of the lower curve of the dotted line  $xy$  will increase as we get nearer to point  $A$ , where, figuratively speaking, this lower curve, growing gradually smaller, will be eliminated and become a dead stop or dead center  $A$ , which, if the wheel is rolling according to the previously stated conditions, will coincide at equidistant points along the ground line  $AB$ .

Let us find the length of the elliptical line  $ACB$ . The simple formula given below allows us to figure with a fair degree of accuracy the perimeter  $p$  of an ellipse, viz:

$$= d \sqrt{\frac{D'^2 + d'^2}{2}} - \left[ \frac{D' - d'}{8.8} \right]^3, \quad \text{Where } D' = \text{Large diameter} \\ d' = \text{Small diameter.}$$

Substituting,  $D' = 9.42$  ft., and  $d' = 6$  ft., we find  $\frac{1}{2}p = 12.26$  ft., approximately.

In one revolution, with our 36-in. wheel, the point  $A$  will then have traveled, in the vertical plane of the wheel, a distance  $ACB = 12.26$  ft., giving us a ratio, or constant of  $12.26 : 9.42 = 1.3$  (approximately). Therefore, in the case of a racing car traveling 100 miles in 1 hr., the point  $A$  will have described, in the same time, a number of half elliptical motions, the total length of which will reach 130 miles.

Since the curved line  $ACB$  belongs to an ellipse and supposing that the rate of speed of the axis  $OO'$  is constant, it results that the rate of speed of the point  $A$ , along the plane  $ACB$ , is not uniform, even if the curve  $AC$  is symmetric to the curve  $CB$ ; if we divide the parallelogram  $AEFB$  in four equal parts or four equal parallelograms, the time necessary for one complete revolution of the wheel is also graphically divided into four equal parts or periods.

### REVOLVING MOTION OF WHEEL AROUND STATIONARY AXIS AND ITS ROLLING MOTION ON GROUND IN RELATION TO MOVING AXIS COMPARED—TWO-CYCLE POSSIBILITIES

A glance at the parallelograms  $AEIG$  and  $GICD$  easily shows that the curve  $AH$  is longer than  $HC$ . A further study of the elliptical line  $ACB$  also shows that, this curve being at its sharpest near the dead stops or dead centers  $A$  and  $B$ , the point  $A$  will reach its maximum speed when approaching or leaving the ground. Couple this fact with the inertia-like effect occurring around the dead center  $A$ , and also the destructive action of the tractive force applied at  $A$  in the case of the driving wheel, and one will easily understand the incredible amount of punishment that an automobile tire is subjected to at racing speeds.

On each revolution of the rolling wheel, the point  $A$  must come to a full stop, at point  $A$  which coincides with the ground, in order that the wheel may exercise its tractive power under correct conditions. These points of coincidence must be equidistant in accordance with the value  $d\pi$ . Hence, if the ratio between the length of the curved line  $ACB$  and straight line  $AB$  is not  $\frac{1.3}{1}$ , evidently the wheel is not running properly:

if, during the time required for the axis  $O$  to travel the distance  $OO'$ , the point  $A$  happens to travel, in the wheel plane, a distance longer than  $1.3 \times AB$  (or  $1.3 d\pi$ ), the wheel is *slipping*; if the point  $A$  travels a shorter distance, in the same period of time as above, than  $1.3 \times AB$ , the wheel is *skidding*.

If the front wheels of a car are out of line, slipping must necessarily occur since point  $A$  travels in this case along a helical plane, in relation to plane  $ACB$ . Then  $A$ 's travel is longer than  $1.3 d\pi$ ; same thing happens in the case of a wobbling wheel (through bent axle or rim), since point  $A$ 's travel cannot remain within the plane  $ACB$ . In the case of a differential-less axle turning a corner, point  $A$ 's travel will be either  $> 1.3 d\pi$  or  $< 1.3 d\pi$ , which means *slipping* or *skidding* for either wheel. All the above cases will cause friction with the ground, loss of power and abnormal wear on tires.

When driving around a curve, the relation  $1.3 d\pi$  remains true, but the centrifugal force will cause extra wear on the tires on account of the side thrust unless the curve happens to be banked in proportion to the speed of the car. It must be also remembered that under ordinary conditions,

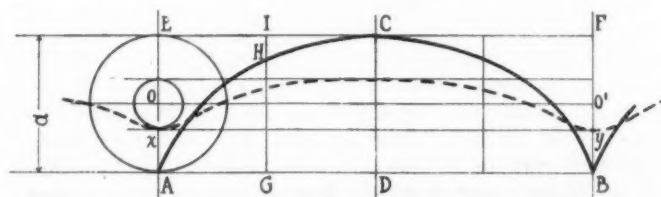


Fig. 1—Motion curves of points on rolling wheel



the wear on the front tires will be smaller than on the rear ones because the former are only subjected to a rolling action while the latter must stand also a propelling and braking action; careless use of brakes is particularly destructive to tires.

Driving through sand or soft dirt gives the same impression as if the brakes were applied to all the wheels; these must make their own tracks as it were, before the car may make any headway. It is very dangerous while driving fast on a smooth road, to drive suddenly on the soft dirt (if there is any on either side of the road), as the steering will be seriously interfered with by the wheel striking the dirt.

In actual practice, we are far from the theoretical conditions of a perfectly round tire meeting a perfectly smooth ground at only one point of contact. A pneumatic tire flattens down to a certain extent, offering an oval surface the size of which is in direct proportion to the weight applied to the wheel and in inverse proportion to the inflation of the tire and the non-resiliency of its material. Among the most important factors upon which depend the tractive possibilities of a given tire are the weight acting on the wheel, the condition of the ground, the design of the tread and the inflation pressure.

## Two-Cycle Engine Development Neglected—Its Possibilities

By E. W. Roberts, M. E.

I HAVE noted with considerable interest the letters in the Forum for June 8 on the subject of the two-cycle engine. I have had some 14 years' practical experience with this type, having designed over fifty and built them by the thousand. My experience covers their use in automobiles, motor boats and aeroplanes. In addition I have done a great deal of work in the capacity of consulting engineer in helping others perfect engines of this type.

My experience, which is confirmed in some measure by the opinions expressed in the majority of the letters referred to, is that the average engineer is very much inclined to jump at conclusions with regard to the two-cycle. Notions get abroad that are taken as truths, and many writers state them as a matter of fact. Take the one matter of the crankcase acting as a scavenging pump, and its effect on the lubrication. The notion is abroad that it will cut the oil and interfere with the lubrication. This notion has absolutely no foundation in fact. It is easily shown to be a fallacy by the fact that the very best way to lubricate a two-cycle of this type is by mixing the oil with the gasoline. I have tried every other possible method, and found that this one not only gave me the best results, but was economical of oil. There is no more fool-proof oiling system imaginable.

### Limitations as to Speed

Another false notion is the two-cycle's limitations as to speed. If the same amount of intelligence is put into the design of a high-speed two-cycle as is applied to the four-cycle, equally good results may be obtained. The same rules apply as to intake and exhaust areas, weight of reciprocating parts, etc., as in the four-cycle type, with this to be kept in mind. The crank angle during which the passages to and from a two-cycle cylinder are open, is about half that in the four-cycle. On this account it is better for extremely high speeds to lengthen the time of admission to the base by the use of some such device as a rotary sleeve valve.

Even running of the two-cycle at low speed is simply a question of port design. Just as in the four-cycle, flexibility and smooth running at low rotative speeds means sacrifice of power at very high speeds. There is nothing to be gained by avoiding base compression. Differential pistons, separate

air pumps, and like schemes only complicate the engine, and the final result in horsepower per pound of engine shows no material gain. It further takes away one of the best points in favor of the two-cycle, its extreme simplicity.

### No Loss of Power

Another false notion that has crept into the minds of the many regarding the two-cycle is loss of power with use, due to leaks by the bearings. Careful design, supported by good workmanship, practically eliminates this feature. It is an actual fact that, in spite of the great care taken in fitting and preliminary running in, I found my aeroplane engines to gain in power with use.

Mr. Gunn speaks in his letter of "The various devices put on, to make the two-cycle motor operate in a satisfactory manner." If these various devices were to be thrown into the junk heap and forgotten, the two-cycle would have a better chance of getting the recognition it deserves. It is these devices and the freak designs of this type that have done more to hold it back than any one thing. My experience is that the first thing the average designer does, when designing a two-cycle, is to devise a number of "improvements" to correct faults that do not exist outside of his imagination. If the engineers, who are now wasting their time with these absurd contraptions, will devote an equal amount of energy to the study of the base compression two-cycle, the type will make some progress.

There is nothing the matter with the base-compression type of two-cycle. What has been holding it back has been poor design coupled with a class of workmanship that would not be tolerated in a country garage. With one or two exceptions, the class of workmanship on the two-cycle cars that were formerly on the market was nothing less than atrocious. Many of the two-cycle marines were, and are to-day, little better in this respect, but the builders of the marine two-cycle have learned more from experience than the builders of two-cycle automobile engines did in the past.

Given equally careful study, with the elimination of false notions from our investigations, the two-cycle may be made fully equal to the four-cycle in flexibility, fuel economy and ease of starting. This is not a wild statement, based on prejudice in favor of this type, but is founded on the fact that I have seen and operated a two-cycle automobile engine which completely fulfilled these requirements. The engine was a base-compression type, and the results were due to a carefully conducted series of tests on the road, backed by careful design and good workmanship. It was particularly unfortunate that the promoter of this car was unable to get sufficient financial backing to place it upon the market.

In conclusion I wish to refer to the fear expressed in the letter of F. N. Nutt that "The present low-test gasoline will cause considerable trouble with the two-stroke motor." This is a very good example of the tendency to jump at conclusions on matters pertaining to the two-cycle. Low-test fuels are the two-cycle engine's long suit. It is the best kerosene engine of the two types. On California distillate, it will operate fully as well as on gasoline.

Tony Jannus in his flight over the Missouri and the Mississippi rivers from Omaha to New Orleans in the Fall of 1912 found the gasoline getting worse, the farther south he went. After leaving Memphis, he got a grade that he stated was almost kerosene. Yet his two-cycle engine worked equally on these grades, and the only difference apparent was greater difficulty in starting.

### Two-Cycle as Ultimate Type

I venture to prophesy that after the two-cycle has been stripped of the utterly baseless notions in regard to it that now prevail, and the same amount of careful research has been applied to this type that has brought the four-cycle to its present state of perfection, it will be selected as the ultimate type of automobile motor.

# The History of the Pneumatic Tire—13

Use of Rubber Tires of Bicycle Type on Sulkies  
and Hansom Cabs—Carriage Tires Developed in  
1892—Pneumatic Wins Popularity on Bicycles

## The History of the American Automobile Industry—40

By David Beecroft

**P**RACTICALLY all this early tire activity centered around the bicycle but the carriage began to attract attention as a market for rubber tires, also. The track sulky for speed purposes using bicycle wheels and tires and ball-bearings was found to be faster than the old form with high wooden wheel with plain bearings, and its adoption dates from about 1892, although a much smaller sulky, driven by a boy and drawn by a dog, had been exhibited in a great many cities in 1891. Sterling Elliott, the maker of hickory-wheeled bicycles, was largely responsible for this movement, and Bidwell tires were fitted in 1892, as were also Sercombe-Bolte tires, and others.

### First Commercial Carriage Tires

Some British hansom cabs were fitted with two rims and springs or cushions of rubber rings between them in 1892, but this form did not survive, although somewhat lighter and less noisy than the steel springs of Whiting. The real commercial development of the carriage tire seems to have been begun in 1892 by the Springfield Rubber Tire Co., of Ohio, which first put out a round tire with a hole through it in which was a wire, a form on the market practically ever since. Later, this was followed by the D-shaped tire having two holes in the base for wires which was found to retain the rubber much better than a single wire. It was put on the market in 1894 by the Rubber Tire Wheel Co., of Springfield, Ohio, and a modification by the Victor Rubber Tire Co., of the same place, about 1896, in which the wires were covered with fabrics or encasements.

### Improvements in Construction

Later, a further improvement in these solid tires was introduced by making ledges along the base in which the retaining wires could be placed by being forced over the edge of the rim. The result of this construction was a slightly wider rim in proportion to the width of the tire above the rim, but the great advantage was that the rubber was firmly held at its very edge by these wires and could not be rocked or rolled out of the rim. Further, the tire could be made endless and thus avoid a joint which frequently gave trouble and the wires could be welded or brazed together before

being applied instead of this being done by holding open the joint for this purpose as is common with the two internal wires.

### Solids for Motor Buggies

These forms, while in constant use on carriages to-day, did not find much acceptance on automobiles. Perhaps the experience of one pioneer is typical of others. The *Chicago Times-Herald* race winner, Duryea, was fitted with round, single wire cushion tires when first put on the road in March, 1895, or a little earlier. These were quite large as tires went in those days but the excess weight and service cut them out in a few weeks and they were replaced with 2-in. single tube pneumatics in May or June, 1895.

The solid tires had quite a boom for use on motor vehicles in connection with the motor buggy industry that began about 1900 and grew quite rapidly just before its slump in 1909. The attempt to secure cheapness in these buggies resulted in undersized tires being used and they wore out quickly. They also failed to protect the cheap, flimsy machinery too often used and were simply another example that, in the early days at least, or with poor constructions, the pneumatic tire was a necessity for a motor vehicle which was operated to the ordinary extent.

### Pneumatic Comes into Its Own

To continue a list of the various proposed designs of pneumatic tires, brought out in 1892 and 1893, would be a publication of names rather than any particular addition to information. Generally speaking, the solid or cushion tire had disappeared from the bicycle by 1892 or the latter part thereof and the pneumatic tire had taken its place. Three fairly well-accepted forms of the double tube pneumatic tire rapidly went to the front and their competitors of wide variety dropped by the wayside. How many of these there were is partly illustrated by the wide variety of rims shown in the advertisement of Warwick, a British manufacturer, in the Nov. 3d issue of *Referee*, 1893. Of these three forms, the cemented tire was cheapest and most common, its casing being split for a short distance on the base to permit inserting a tube having closed ends.



# ACCESSORIES

## Crane Power Tire Pump

**I**N the Crane single-cylinder power tire pump a special patented alloy packing ring is used instead of the piston rings usually employed in power tire pumps, the manufacturer stating that this ring is so arranged between the piston and the cylinder walls that leakage cannot occur and oil is prevented from getting into the compression chamber, and hence cannot reach the inner tube. It is claimed the efficiency of this construction is 97 per cent.

Pumps can be supplied for any make of car and the work of installing may be done by the car owner, no drilling of holes or machine work being necessary, as the brackets are designed for attachment to bolts or studs already on the engine. The question of drive connection is solved by the use of split gears designed to fit the car on which the pump is to be mounted. With hose and pressure gage, the pump sells for \$8.—Bay State Pump Co., 275 Congress Street, Boston, Mass.

## Badger Gage for Fords

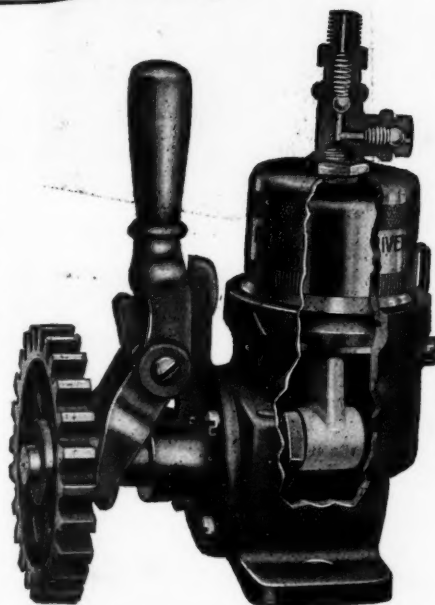
This device is combined with the filler cap and screws into the opening in the tank. The dial is marked for gallons and registers up to 10. Price, \$1.25.—Badger Crafts Shop, Sheboygan, Wis.

## J. B. D. Resilient Wheel

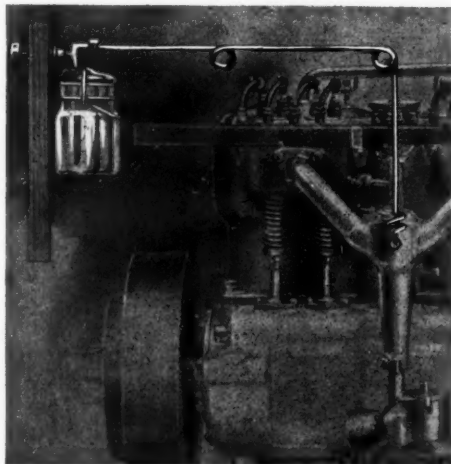
A housing built around the hub of the wheel contains a set of nine rubber disks arranged in a circle; the hub carries a plate with notches fitting the disks and a corresponding plate is carried by the wheel, the drive passing from the inner to the outer plate through the disks. The housing is of malleable iron, the wheel proper of wood and the disks of a special rubber which the makers state is good for from 15,000 to 20,000 miles and can be replaced for 20 cents each. The only attention required is the application of graphite three or four times a year. For Fords and other light cars. Price for four wheels without tires, \$60.—J. B. D. Resilient Wheel Mfg. Co., Milwaukee, Wis.

## MacDonald Cleaner and Primer

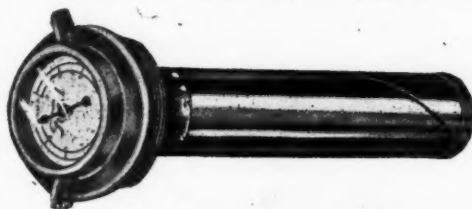
This engine-cleaning and priming device consists of two glass containers. These are interchangeable, and are connected, through a needle valve, by a copper tube to the manifold. The valve is governed by a button and the whole apparatus is fastened to the dash. For



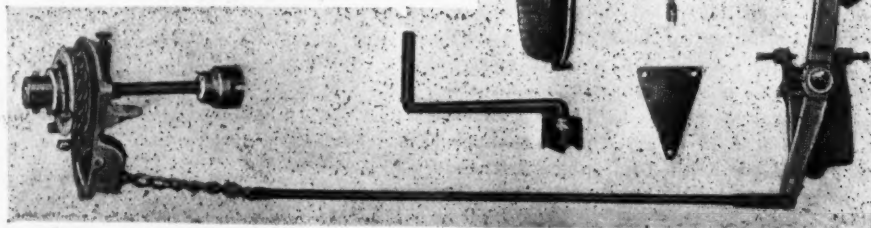
Crane power tire pump, showing patented alloy packing ring



MacDonald clearing and priming device



Badger gasoline gage for Fords



Shur-Go pedal-operated starter for Fords

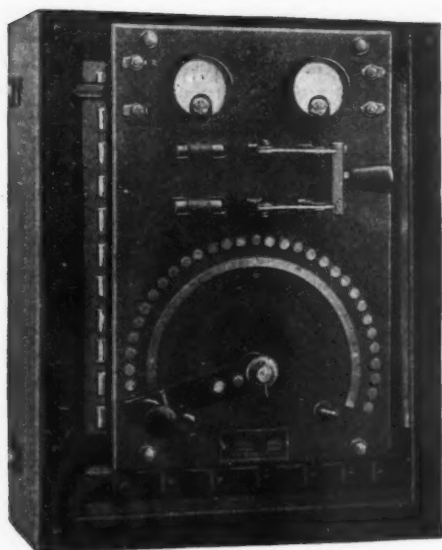
priming, a solution of 1 pt. of high-test gasoline and ½ oz. of commercial ether is placed in the container. The charge is released by the button and passes, by the syphon process, to the cylinders just after the engine is stopped. It remains in the cylinders until the engine is turned over, when it is fired instantaneously. For cleaning purposes the second container is used when filled with a solution of salt and water. As the contents of the jar are released, the extreme heat of the motor superheats the salt, which oxidizes the light carbon dust. The water is vaporized when it hits the firing chamber and becomes superheated steam, which drives the oxidations through to the exhaust.—F. A. MacDonald, Grand Rapids, Mich.

## Shur-Go Starter

This is a pedal-operated starter designed for Fords, and consisting of a ratchet pulley attached to the crankshaft and which is rotated by a chain passing over another pulley and connecting to the lower arm of the pedal by a long rod. Price, \$17.50, installed.—Peoria Specialty Co., Peoria, Ill.

## Cutler-Hammer Rheostats

Two small rheostats to control the charging of starting-lighting storage batteries when a charge from an outside source is necessary, or charge lighting batteries when there is no generator on the car. The smaller model is for wall mounting; it has several resistance units inclosed in a sheet-iron case, and a slate panel carries several contact buttons, switch lever and binding posts. The smaller model, G, is made in two capacities—2½ and 5 amp. and 5 and 10 amp. respectively—based on 115-volt direct-current supply and the usual three-cell 6-volt battery in series. The larger model is particularly suited for service in garages and will charge any number of cells up to forty-four lead type and sixty Edison on 115-volt supply, or eighty-eight lead and 120 Edison on 230-volt supply. The larger model has a sheet-metal cas-



Cutler-Hammer garage rheostat

ing for wall mounting, containing the resistance units and carrying a slate panel on which is a movable arm working over thirty contact points. When required, a double-pole knife switch for the main line, an ammeter and a voltmeter can be mounted on the panel. The ammeter is permanently connected in series with the rheostat and indicates the charging current at all times. The voltmeter has a 15-volt scale and is intended for use with flexible leads so that the voltages of separate cells can be obtained at any time.—Cutler-Hammer Mfg. Co., Milwaukee, Wis.

#### Searchlight Oxy-Acetylene Outfits

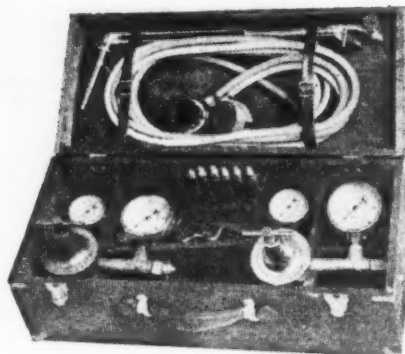
A complete oxy-acetylene outfit for welding and cutting is put up in a case, the set including the following items: 20-in. welding torch with seven tips and hose connections,  $3\frac{1}{2}$ -in. acetylene regulator with 300-lb. and 50-lb. gages and connections,  $3\frac{1}{2}$ -in. oxygen regulator with 3000-lb. and 150-lb. gages and connections, 10-ft. high-pressure black acetylene hose and clamps, 10-ft. high-pressure white oxygen hose and clamps, wrench, goggles and instructions. The weight of the outfit is  $28\frac{1}{2}$  lb. The oxygen regulator may be used in connection with a cylinder decarbonizer, which is furnished at extra cost. Price, \$50.—Searchlight Co., Chicago, Ill.

#### Ames-Ton Truck for Fords

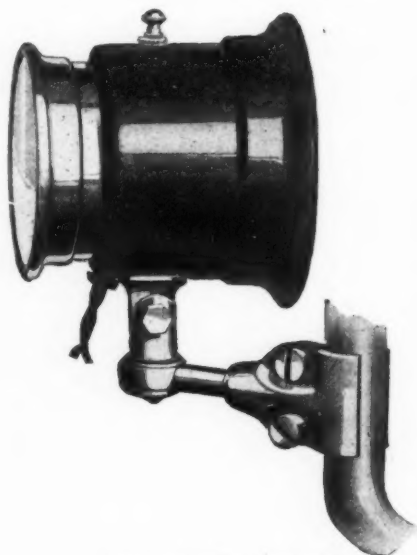
Worm drive is the particular feature of the Ames-Ton attachment for converting a Ford into a 1-ton truck. A heavy channel frame to support the truck body is bolted around and to the rear of the Ford frame. The weight of the truck is carried on half-elliptic springs; 3-in. expanding brakes are fitted. The wheelbase is 120 in., tires 32 by  $3\frac{1}{2}$ , and rear wheels are of hickory, with 2-in. spokes. Tread is 56 in. and the loading space, back of the driver's seat,  $8\frac{1}{2}$  ft. It weighs 1100 lb., which added to the weight of the Ford chassis brings the unit up to 2000



Cutler-Hammer small rheostat



Searchlight oxy-acetylene outfit



Amco swivelled spotlight

lb. The gear ratio is 6.2 to 1. The price is complete with all fittings, and the change may be made in a few hours, it is said. Price, \$395.—Ames Motor Car Co., Owensboro, Ky.

#### Amco Spotlight

This light is mounted on a swiveled bracket attached to the windshield. The front glass is 5 in. in diameter, and at the rear is a 4-in. plate-glass mirror. Light is supplied by a 6-volt 15-candle-power nitrogen bulb. The clamp will fit any standard windshield. The body of the lamp is made of heavy sheet copper and the finish is velvet-black, except the rear part and hanger, which are nicked. Weight, 20 oz. Price, \$7.50.—Art Metal Mfg. Co., Cleveland, Ohio.

#### Aerofram Air Valve

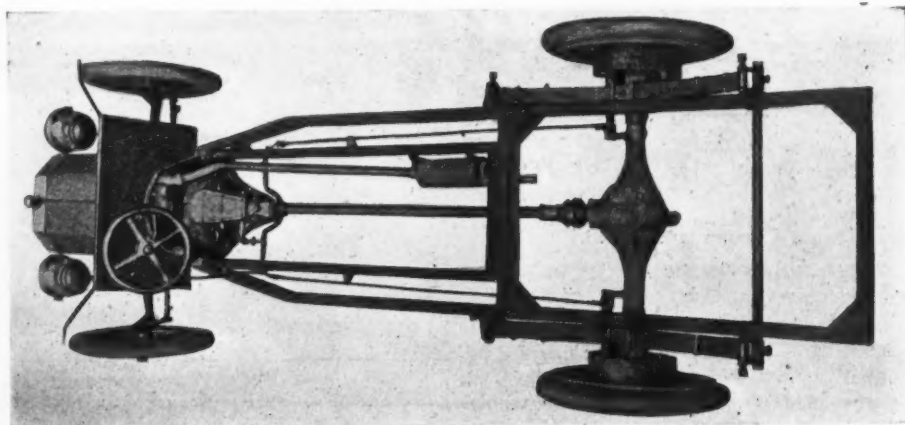
The Aerofram is a small spring-loaded automatic air valve which screws into the intake manifold and supplies extra air to improve the vaporization of the gasoline and to furnish the extra oxygen made necessary by the improved vaporization. There is nothing to adjust and the valve can be applied in a few minutes. It sells for \$1.—The Aerofram Co., Inc., Boston, Mass.

#### Voss Auto Watch

The Voss Auto Watch attaches to the steering post by means of a clamp and spring bracket. It may be set at any angle desired. No screws or bolts are required and it can be put in place quickly or wound while the car is in motion. New watches may be obtained and secured in the case to replace an old or damaged watch. Price, \$2.—Voss Auto Watch Co., Des Moines, Iowa.

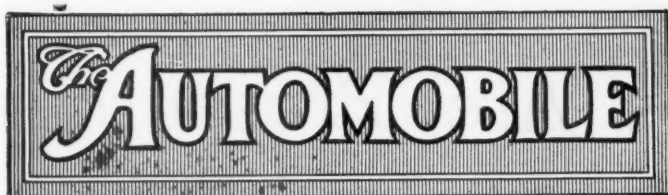
#### Letter-Pack-It

An envelope for carrying a letter and a small bag for carrying merchandise sewed together, end to end, form a single package and avoid the necessity for sending the two separately. Spaces are provided on the envelope for first-class letter postage for the letter and parcel post stamps for the merchandise. Three sizes are made.—Letter-Pack-It System, Detroit, Mich.



Ames-ton worm-driven truck attachment for Ford cars





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## Caterpillar Tractors

THE article dealing with the good points of caterpillar type drives for tractors, of which the first part appears on page 184, is a result of experience extending over 11 months of use. Admittedly, the author, although entirely unconnected with the tractor industry, has had more to do with the caterpillar type than with wheeled tractors, and he may probably underestimate the advantages of the latter over the former.

Both the wheeled design and the caterpillar tractor are as much in their infancy as was the passenger car in 1900; we do not even know whether the truck type of engine is going to win out in competition with the heavy stationary gas engine sort. It is highly improbable that it will take 16 years to bring the tractor as near finality as the past 16 years have brought the passenger car. Rather, may we expect 6 years to settle the more vital questions, or even a shorter time, perhaps.

Meanwhile, it is experience that is needed; proper accounts of work done and money expended; full lists of troubles and repairs. Such will soon be available from the many farmers who are trying the modern method of cultivation. Just as we have more than one type of automobile so, no doubt, there will be more than one type of tractor always, and the caterpillar, even if it has great drawbacks, does seem able to perform some remarkable feats.

## Exports Highest Yet

THE value of automobile exports from the U. S. for the year ended June 30, 1916, are only a trifle less than double the value for the previous year. Especially noteworthy is the fact that this is not due to the large exports of commercial vehicles, for of a total increase of \$52,000,000, commercial cars only account for a little less than \$18,000,000. Parts, excluding tires, have increased \$15,000,000, leaving the balance of \$19,000,000 to be credited to the passenger car increase.

In regarding this remarkable figure it must be remembered that Europe has been a closed market by reason of high tariff and, subsequently, prohibition of imports, since October, 1915. The detail figures for June, 1916, give the answer to the question of where these extra cars are going, for they show that the British colonial empire is buying a very large quantity and that the South American countries added together make a big total. It is obvious that America now has a firm hold on the markets which have been in the habit of buying largely from Europe, and it is a credit to the American industry that the loss of the important European market has been so much more than offset by the increase in other fields.

## Ford

AT a time when raw materials are at the highest price ever known, and with the highest paid labor in any factory in the world, Ford drops his price 18.2 per cent. Why is it that such a thing can be done when almost every other motor car maker is raising prices?

The answer is that Ford has had a single aim, a single system, a steadfast purpose; unchanging for year after year. At the very start Ford's ambition was to do just one thing, and to do it better than anyone else in the world; his aim to-day is just the same as it was in the beginning. Ford has always stuck to the highroad of his choice, has never been led off down a side turning. His progress is something like that of a man who starts to drive across a strange city; he has made best time by choosing just one of the many avenues and sticking to it. He has never tried to cut across into another because of a rough patch ahead, on the chance that the unknown street would be smoother.

Ford stands as a great example, not only to the automobile industry, but to all industry, a great example of the enormous success obtainable from one thing done well. The temptation to depart from the original idea must many times have been enormous; that no such departure could possibly have been advantageous admits of no argument.

His work recalls those immortal lines of Owen Meredith:

"The man who seeks one thing in life—and but one—  
 May hope to achieve it ere life is done.  
 But he who seeks all things wherever he goes  
 Only reaps from the hope which around him he  
 throws—a harvest of barren regrets."

# Australian Industries Are Prosperous

Financial Conditions Throughout Continent 95 Per Cent Normal—Over 60,000 Cars in Use and Market Growing—Three Tire Plants—Body Building Progresses

**N**EW YORK CITY, July 29—Financial conditions in all of Australia are approximately 95 per cent normal, according to Peter McIntosh of McIntosh & Sons, Ltd., Sydney, who has been visiting in this country for several months. In spite of the war Australia is enjoying more than ordinary prosperity, largely due to the wartime prices being paid for so many of her natural products, such as grains, meats, wool, etc.

The financial situation in Australia is best demonstrated, according to Mr. McIntosh, by the quick subscribing for the different war loans. The first war loan of \$25,000,000 was oversubscribed, there being \$65,000,000 actually offered. The second war loan of \$50,000,000 was subscribed to the extent of \$110,000,000, and the new loan of \$250,000,000 which is being talked of will be more than doubly subscribed, according to present indications. These facts indicate that there is plenty of money in Australia.

## Nearly 70,000 Cars

Automobile business is suffering more or less because of the high ocean freight rates and the inability to get ships, as well as to the high price of gasoline. Australia has between 60,000 and 70,000 cars. Approximately 20,000 were sold during 1915. As in America, 70 per cent of the cars sold in Australia are going to the farmers. The term farmer must be interpreted somewhat differently than in this country. Many of the Australian farmers are large property owners and have huge herds of live stock. Others are engaged solely in mixed farming. Ford is the biggest seller, and is followed by Overland, Buick, Studebaker, Dodge, Chevrolet, Maxwell and others.

Due to the fact that gasoline is selling wholesale at Australian seaports at 60 cents per gallon—the imperial gallon is used—it is necessary to talk gasoline economy in making sales, and those dealers engaging in quantity business must be capable of showing 23 to 30 miles per imperial gallon. The imperial gallon is approximately one-sixth larger than the gallon used in this country. All of the gasoline used comes from the island of Borneo and is handled in 5-gal. cans, with two cans crated together. This method of handling is expensive and there is a movement on hand to introduce

the bulk system, the same as used in the United States.

Lubricating oils are much more expensive than here. The price in such cities as Sydney, Melbourne, Adelaide, Brisbane, New Castle and Perth averages \$1.50 per gallon, as compared with 50 cents here.

## Three Tire Plants

Australia is not an automobile-manufacturing country, but has made much progress in the manufacture of pneumatic tires and also of car bodies. The three tire factories employ from 3000 to 4000 men and are producing upward of 2500 pneumatic tires per day, which is sufficient to practically care for all of the cars in the country. Tires sell for approximately twice as much as they do in North America. Because of the manufacture of tires in Australia the majority of the Australian dealers buy their cars from the United States without tires, this being to develop the tire business in Australia and assist the three tire factories there. The majority of Overland and Cadillac cars, however, are shipped with tires. Australia uses metric sizes, and the majority of tires are clincher type. Some straight-side types are being introduced into Australia; but there seems to be a preference for the clincher type, a condition naturally favored by the Australian manufacturers. One of the tire factories is the Dunlop, which is a branch of the English company; the other two are local organizations.

## Body Building Important

Body building in Australia is an important industry and is a development of the old carriage trade. The Government has recognized this body-building industry and is protecting the local manufacturers by a heavy import duty. The present duty on a five-passenger body is \$125. Because of the local body-building industry many Australian dealers prefer to buy stripped chassis in the United States and have bodies fitted in Melbourne or Sydney, where the body-building interests are centered. A good five-passenger body costs approximately \$450 in these cities. There is not much economy in having the body built as compared with buying the chassis fitted with the standard factory body. In purchasing

chassis without bodies from the American manufacturer approximately 50 per cent of the real cost of the body is generally remitted by the manufacturer.

Australian dealers and garagemen are generally well fitted to handle all matters with regard to car repairs, etc. When electric lighting and starting were introduced there was some difficulty at the start in obtaining efficient help, but the work of the Delco company in having its representatives visit all Australian cities for the purpose of educating dealers and garagemen in caring for such apparatus helped very materially. It is not now difficult to obtain good electrical experts, who generally are of French or Swiss parentage.

## Battery Troubles

During the past season the battery question has been giving more trouble than perhaps any other, and it is not yet settled. Australia has a climate which is fairly severe on batteries, in that the summer is particularly hot; and with a temperature of 125 deg. Fahr. in the interior during the summer months of December, January and February, there has been more or less trouble with plates warping from the heat so that positives and negatives squeeze the separator so as to form a short circuit. In the coast cities, such as Sydney, the summer temperature rarely rises above 80 deg., so that there is no difficulty in such places.

Some of the battery manufacturers are improving their batteries by extending the separators a certain distance below the plates, thereby making it impossible for the bending of the plates to bring positives and negatives together and cause short-circuiting.

## Lack of Standardization

The major complaint that many Australian dealers have with regard to batteries for starting and lighting is the lack of standardization, particularly in terminals, which makes it difficult to meet all the exigencies. With the present lack of standardization it requires about forty different models of batteries to care for all of the different American cars in Australia, so that any Sydney or Melbourne dealer or supply house aiming to be ready to meet any exigency in the battery field would have to be stocked to that extent.



It has been suggested that if greater standardization of terminals were accomplished four or six different models would suffice. This would make it much easier for the automobile supply man in Australian cities.

Mr. McIntosh when speaking on this subject said:

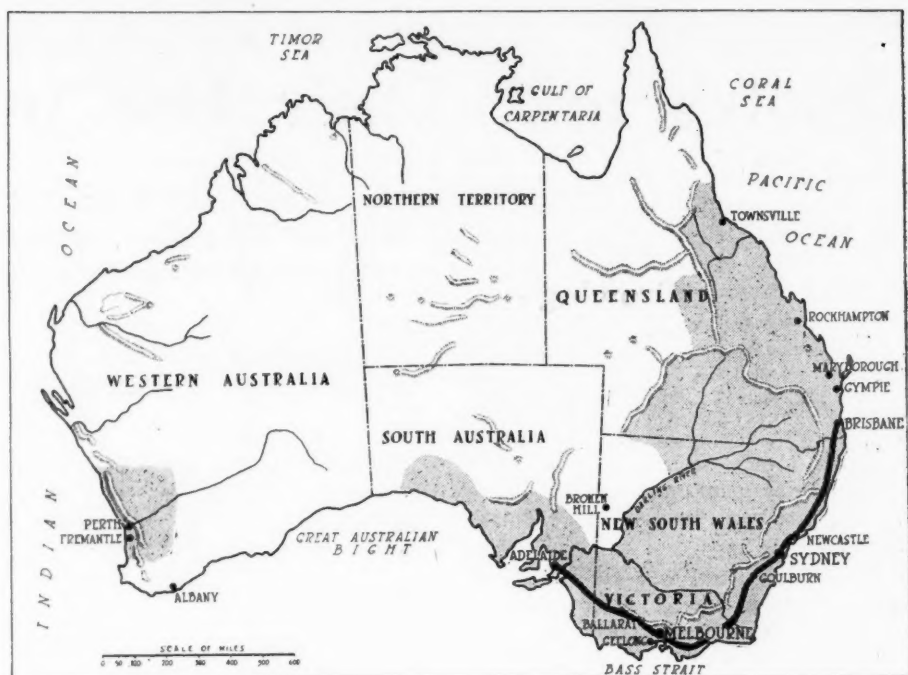
"There are three sizes of batteries that would serve at least sixty or seventy makes of American cars, and after close investigation there are not three different makes out of this number that could be connected up to any one battery model without making alterations in terminals or connections. If standardization were carried out a dealer or service department in a foreign country could replace the battery of almost any American car out of a stock of four sizes. As matters stand to-day, it requires a stock of forty different battery models, and then the dealer is not absolutely certain that he can do it."

#### A Growing Market

Australia as an automobile market is going to increase. At present it has been absorbing cars at a satisfactory rate in proportion to the population. With a population of 5,000,000, it has, say, 70,000 cars. On this ratio, with a population of 105,000,000, which is the same as that of the United States, it would have 1,470,000 cars. Australia's ratio of cars to population is thus scarcely one-half of that of the United States. Australia has a particularly homogeneous population. Colored races have largely been barred, and it is due to such prohibition that the population of the continent is not higher. With its present almost pure white population the buying capacity is higher than it ordinarily would be with heavily mixed races. There are islands in the Pacific Ocean with populations of 30,000,000 but which cannot be compared with Australia in purchasing capacity.

Australia has not yet taken up the road-building movement as it should. There are approximately 1800 miles of substantially improved highways. Between Sydney and Melbourne, a distance of 600 miles, there is a good road. These cities have populations of 800,000 and 700,000 respectively. From Melbourne to Adelaide, another stretch of 600 miles, there is a good road. The population of Adelaide is 200,000. From Sydney to Brisbane, 660 miles, there is another good macadam road. Brisbane's population is 150,000.

These three links of roads are all connected in the form of a huge crescent, as these four cities are located in the southeastern part of the continent, and, starting from the left-hand side of the crescent and going to the right-hand, the cities in order are Adelaide, Melbourne, Sydney and Brisbane. All are seaport places. All of this 1800 miles of highway



Map of Australia, showing the 1800 miles of substantially improved highways composed of the 600-mile stretch between Sydney and Melbourne, another 600-mile stretch from Melbourne to Adelaide, and a third of 600 miles from that city to Brisbane. Road development in other sections has been slow. Shaded portions indicate automobile districts.

was built some years ago and, owing to the present government system of roads, improvement has not been rapid since that date. The motorists are working for improved systems so that trunk highways will be extended into the interior. Considering the present road system in Australia and the population of the continent, the sale of cars has been particularly heavy.

#### Dealers' Expenses Heavy

The United States car manufacturer may find difficulty in realizing the cost to which the Australian dealer is put because of ocean freights, import duties, etc. Take a typical United States car that would retail in this country for \$750. It costs approximately the same amount to get this car into the dealer's salesroom in Melbourne or Sydney. Some of the major items are freight from New York to Melbourne or Sydney, freight from the factory to New York, packing at the factory, duties of various sorts, etc. The following tabulation gives some conception of these expenses:

Packing at factory.....	\$26.00
Freight, factory to New York.....	30.00
Freight, New York to Melbourne.....	320.00
Duty on body.....	125.00
Chassis duty, 10 per cent.....	50.00
Tires, 60 cents a pound.....	50.40
Duty, lamps and accessories.....	28.00
Duty, top and windshield.....	30.00
Exchange, commission, insurance, etc..	70.00

The question of exchange, commission, insurance, etc., is one that is generally little understood with American dealers, as they have not to bother with it. It costs approximately 2½ per cent for conversion from United States currency into Australian; that is, the Australian dealer

pays approximately this much on his bill. In addition, exchange costs 2½ per cent between Melbourne or Sydney and New York. Marine insurance costs approximately 2 per cent. If the Australian dealer operates through a New York shipping house or exporter he pays 2½ per cent for his service. All told, there is 10 per cent added because of these four items. It is possible to eliminate the 2½ per cent commission to the exporter if the Australian dealer can do his business direct with the United States.

Freights have gone up very materially on the ocean because of the war. Before the war freights were \$8 per cubic ton, and since the war they have risen to \$40 and \$45. During the past few days there has been a reduction of approximately \$10 per cubic ton. A cubic ton is equivalent to 40 cu. ft., and a medium-price car selling around \$800 occupies approximately a 9-ton space, or 360 cu. ft. Freight rates from Liverpool to Sydney before the war were \$8 per cubic ton and are now \$30. These figures apply, of course, to automobile shipments.

#### Armored Cars for U. S. Warships

WASHINGTON, D. C., July 29—Armored automobiles cradled on the decks of warships, in seagoing rafts, for the use of detachments of the United States marine corps in shore operations, may soon be added to the regular equipment of naval vessels.

Experiments at the Boston navy yard have demonstrated that these cars can be stowed aboard by the means of electric cranes on war vessels in a few minutes and take up small deck space.

# Quotas and Their Use in Salesmanship

System Makes Use of Estimates Each Year Based on Past Performance, Business Conditions, Business Population, Size of the Company's Organization and Factory Capacity

**I**N his talk on Quotas at the recent World's Salesmanship Congress at Detroit, F. H. Dodge, sales manager of the Burroughs Adding Machine Co., Detroit, Mich., stated that his company is a firm believer in the use of quotas in salesmanship. In developing the quota system the company estimates at the beginning of each year the amount of business it should be able to secure, this estimate being based on past performance, business conditions, business population, size of the company's organization and factory capacity. In further explaining the application of the quota system, Mr. Dodge said:

For example, let us suppose our quota for this year to be \$10,000,000 or 400,000 points; \$25 worth of business represents a point; about twelve points represents an average sale.

Our first move would be to split these 400,000 points into 121 sections, because there are 121 Burroughs agencies in the United States and Canada. Quota sections vary in size according to the sizes of the agencies—as based upon territory values.

## Agency Quotas by Months

Our next move would be to distribute the agency quotas by months. Agency quotas are not divided into twelve equal parts, for experience has proven, in our case, that with a corresponding effort more business can be secured in December than in January. Our June business has, also, always exceeded our July business. Other variations in monthly quotas are likewise necessary.

The proportion of our year's quota assigned to each month is as follows:

January .....	8%	July .....	7%
February .....	7%	August .....	7%
March .....	8%	September .....	8%
April .....	8%	October .....	8%
May .....	8%	November .....	9%
June .....	10%	December .....	12%

Our only stipulation in assigning salesmen's quotas is that 720 points shall constitute a minimum year's quota for a salesman. We made the minimum quota 720 points, or \$18,000 worth of sales, because that is the minimum account of business we expect a fair salesman to produce in a year.

A smaller business does not yield a profit sufficient to attract the class of salesmen we wish to employ.

When we find a sales manager has cut territories so small that, if properly

worked, the salesman cannot secure a 720 point business in one year, we insist that the salesman's territory be increased in size.

I have now explained how we establish the company quota, how it is distributed by months and agencies and by sales managers to salesmen, but I have not touched upon another important condition in our quota scheme; that is, territory valuations.

How to determine with reasonable accuracy the various territory values has been one of our real problems.

We do not claim, even after twelve or thirteen years' experience of quota building, that we have the problem solved, but each year we are getting nearer to the ideal situation.

The deeper we go into the subject of quotas, the more certain we are that it is worth while and that there is much to learn about scientific quota building.

In the early days, we used population as the basis for determining territory values. Population is still used in our quota plan, but not alone.

To obtain a good guide to territory values, it was found necessary to supplement population figures with other statistics and data.

The sales value of population varies in different sections of the country; at least we have found it so. For example, 10,000 population in Texas, California, and in the Northwest was proved to be of greater sales value to us than the same population in the Central States or the East Coast States.

Reasons: Extensive credit systems in use in the South require more bookkeeping, consequently more adding machines for each unit of population.

In California and the Northwest, more young men educated to modern business methods are conducting the business of those sections.

These and other conditions naturally account for the variation in population values to which I have referred.

## Accessibility of Prospects

To supplement the influence of these variations in population values, we later took into account past performances, accessibility of prospects, business conditions, and business or trade population.

The accessibility of prospects was found to be an important factor because this governed, to a certain extent, the

amount of time salesmen could spend in the presence of each P. B., prospective buyer. Thickly settled territories should naturally carry larger quotas than sparsely populated territories.

Business population was our next important addition to the group of quota factors. It was in 1909, I believe, that we started to analyze territories to determine their business population. The Rapid Addressing Machine Co., of Chicago, made our first tabulation of business prospects.

## Analysis of Previous Sales

Our first move toward this tabulation was to analyze carefully our previous sales to determine the most productive fields. We were then making a rather respectable showing in ninety-six lines of business. We gave this list of lines of business to the Rapid Addressing Machine Co., and this firm in turn made a tabulation of their lists by states, by lines of business and according to certain financial ratings which we specified. Their list was compiled from Dun's and Bradstreet's supplemented by other sources of information with which we were not entirely familiar.

In those days we had fewer agencies, and State lines, to a certain extent, became our agency boundary lines. Our lists were, therefore, compiled according to the business population of each State.

During the next two years, we did considerable cutting of territories and then, of course, found need for a business population tabulation by counties.

We purchased this information from the Boyd's City Dispatch, New York, at a cost of \$1,000 plus an additional cost for copy work. I do not recall the cost of the copy work.

The second list was much better than the first, because with business population by counties to guide us, we were in better shape to ascertain the actual territory values.

In 1909 we were compelled to prorate values according to business population where two or more agencies were within one state.

Prior to 1909, the year business population by counties was introduced, it was not always easy to convince the sales manager that quotas were fair. Since that time, we have had very little trouble of that nature; for, generally speaking, the field men know that we know, prob-



ably better than they, the actual quota value of their respective territories. We have the real figures to prove the values. There is, consequently, not much excuse for fault finding.

In the early days of our quota experience, we were making only a few models of machines. We now make nearly 200. Therefore, a further refining of our quota plan was necessary to obtain good representation for the models of the long line. Various machines in the long line now carry separate quotas as do certain very productive special fields or lines of trade.

The more recent refinements in our quota scheme are necessarily more complex and would not be readily understood by one familiar with our business.

Quota enters into many phases of our business building plan. The per cent of quota secured indicates to a certain extent the relative ability of salesmen. Without these figures we would not be able to determine as well as we can now the men who are most entitled to promotion.

Friendly rivalry within an organization, if properly inspired, helps business. We use it extensively.

It would not be possible to use this rivalry as we do if we had no agency and individual quotas.

Our sales bulletin is issued each month and contains quotas, points secured, and the per cent of quota made. We make a practice of featuring in sales bulletins creditable records of individuals and agencies.

## 105,488 Cars in Bay State

### Registrations for 6 Months Compare with 102,533 for Entire Year of 1915

BOSTON, MASS., July 29—Massachusetts registrations for the first 6 months of 1916 show a great jump over the same period of 1914 and over the entire 12 months last year. There was listed July 1 here 105,488 motor vehicles. For the same period in 1915 there were only 83,868 booked, a gain of 26 per cent, or 21,620 machines. During the entire 1915 period there were 102,633 cars registered so that the gain to date over all of last year is 2855 cars. And it is expected that there will be at least 125,000 machines registered in Massachusetts before the year ends due to the big demand the dealers are having now. The gain in trucks shows to greater advantage comparatively. Of the registrations above 14,800 were commercial vehicles. For the same 6 months of a year ago there were 9900 registered, a gain of 4900, or about 50 per cent. For the

entire 12 months of 1915 there were 11,960 registered so that to date there are 2940 more registered than all of last year. And the trucks sales are increasing. As a result of the increases the State has been enriched also in fees. During the first 6 months of 1915 there was paid in to the Highway Commission \$999,254.90. Up to July 1 this year the State has received \$1,232,164.63, or \$252,639.63 more than for the same period of 1915, and \$29,744.44 more than all the fees gathered in the 12 months of last year. Herewith are the figures.

Of the cars registered it is surprising that nearly 65,000 of the total is covered by just sixteen different makes. There are that many that have more than 1000 cars listed, the Ford standing far ahead, with 22,640. That is about 20 per cent of the entire registration. According to the figures as compiled by the Auto List Co. up to June 24 the cars are listed as in the table below.

#### Allen Holds Dealer Convention

FOSTORIA, OHIO, July 29—The dealers of the Allen Motor Co. held their annual convention at the factory last week. New cars were inspected and business and sales sessions were held.

#### Massachusetts Registrations for 6 Months in 1915 and 1916

	To July 1, 1915	Entire Year 1915	To July 1, 1916	Gain Over First 6 Months 1915	Gain Over Entire Year of 1915
Automobiles....	83,868	102,633	105,488	21,620	2,855
Trucks .....	9,900	14,733	14,800	4,900	2,940
Fees .....	\$999,524.99	\$1,205,420.19	\$1,232,164.63	\$252,639.73	\$29,744.44

#### Analysis by Makes of Massachusetts Registrations in 6 Months of 1916

Ford .....	22,640	Fiat .....	168	Paterson .....	34	Cutting .....	12
Buick .....	6,711	R. C. H. .....	160	Motorcar .....	31	Havers .....	12
Overland .....	5,693	Interstate .....	150	S. G. V. ....	31	Johnson .....	12
Cadillac .....	4,987	Anderson .....	138	Atlas .....	30	Mercedes .....	12
Studebaker .....	3,509	Grant .....	137	Briggs .....	30	Buckeye .....	11
Hudson .....	3,171	Krit .....	136	Ohio .....	30	Parry .....	11
Maxwell .....	2,733	Abbott .....	125	Daimler .....	29	Partin .....	11
Packard .....	2,531	Simplex .....	123	Lexington .....	29	Republic .....	11
Chalmers .....	2,178	Amer. Mot. ....	121	Marquette .....	28	Elkhart .....	10
Dodge Bros. ....	2,012	Pullman .....	121	Bergdoll .....	27	Lion .....	10
Reo .....	1,810	Apperson .....	113	Pathfinder .....	27	Royal .....	10
Metz .....	1,594	Everitt .....	105	Nyberg .....	24	Standard .....	10
Pierce .....	1,364	Bailey .....	104	Clarke-Carter ..	23	United .....	10
Chevrolet .....	1,230	Columbia .....	102	Grout .....	23	Daniels .....	9
Oakland .....	1,118	Imperial .....	101	Hereshoff .....	22	Isotta .....	9
Jeffery .....	1,020	Thomas .....	101	Matheson .....	22	Sears .....	9
Hupp .....	989	Marion .....	97	Lyons .....	21	Cameron .....	8
Stevens .....	980	Auburn .....	94	Woods .....	21	Davis .....	8
Oldsmobile .....	878	Case .....	88	Corbin .....	19	Sampson .....	8
Franklin .....	821	Briscoe .....	87	De Tamble .....	19	Austin .....	7
Stearns .....	714	Empire .....	83	Knight .....	19	Buffalo .....	7
Paige .....	694	Little .....	81	Lancia .....	19	Cunningham .....	7
Chandler .....	650	Warren .....	79	U. S. ....	19	Gen. Veh. ....	7
Stanley .....	617	Baker .....	76	Crow .....	18	Linscott .....	7
Pope .....	606	Renault .....	75	Moyer .....	18	Royce .....	7
Peerless .....	605	Elmore .....	73	Penn .....	18	Detroit .....	6
Saxon .....	601	Allen .....	67	Babcock .....	17	Gen. Mot. ....	6
Winton .....	543	Michigan .....	66	De Dion .....	17	Henry .....	6
Mitchell .....	533	Trumbull .....	66	Elec. Veh. ....	17	Hotchkiss .....	6
Jackson .....	522	Rauch-L. ....	64	Garford .....	17	Itala .....	6
Regal .....	451	Speedwell .....	63	Napier .....	17	McIntyre .....	6
Locomobile .....	425	Crawford .....	61	Pilot .....	17	Am. Cycle .....	5
White .....	412	Westcott .....	59	Acme .....	16	B. C. K. ....	5
Velle .....	408	Waverley .....	56	Herff-Brooks ..	16	Bell .....	5
Cole .....	399	Autocar .....	54	Monroe .....	16	Chadwick .....	5
E. M. F. ....	382	Selden .....	54	Welch .....	16	Enger .....	5
Kissel .....	326	Moon .....	53	Detroit .....	15	International ..	5
Haynes .....	325	Cartercar .....	52	Millburn .....	15	Lewis Spg. Ax. ..	5
National .....	324	Amer. Loco. ....	50	Vulcan .....	15	Mora .....	5
Stutz .....	324	Palmer-S. ....	43	Am. Voiturette ..	14	Panhard .....	5
Knox .....	320	Dort .....	42	Columbus .....	14	Pickard .....	5
Dayton .....	295	Flanders .....	42	Consolidated ..	14	Rochet .....	5
Marmon .....	239	Henderson .....	41	Easton .....	14	Staver .....	5
Premier .....	222	Moline .....	38	Owen .....	14	Wayne .....	5
Mercer .....	211	Brush .....	36	Benz .....	13	Willis .....	5
Lenox .....	200	Berkshire .....	35	Courier .....	13	40 mfrs. each 4 ..	40
Scripps-Booth ..	199	Marathon .....	35	Lewis .....	13	15 mfrs. each 3 ..	45
Lozier .....	186	L. P. C. ....	34	Mutual .....	13	39 mfrs. each 2 ..	78
King .....	183	McFarlan .....	34	Schacht .....	13	163 mfrs. each 1 ..	163

## To Define Truck Requirements

### Automobile, Military and Naval Men Study Mobilization Problems

WASHINGTON, D. C., July 31—Another meeting was held this week at the War College here to discuss plans for mobilization of troops and supplies in time of war, particularly so far as civilian organizations are concerned. Major Palmer E. Pierce of the General Staff Corps presided at the meeting, Lieut. Col. Chauncey B. Baker being present to represent the Quartermaster General's office. Representatives of the Naval Consulting Board, the National Automobile Chamber of Commerce, the Society of Automobile Engineers and the American Automobile Assn. committees were in attendance.

Information is being collected as to just how many government departments need a large motor truck equipment, in order that suitable specifications can be developed for each type of truck required. The Truck Standards Division as well as other Divisions of the Standards Committee of the Society of Automobile Engineers will, as in the past, take a leading part in this work. Serious attempts will be made to develop specifications of proper length, that is, neither too long nor too short, covering adequately the requirements of the government, which it is felt will eventually harmonize to a greater extent than has been expected heretofore with the needs of private users of commercial motor vehicles. Some well qualified experts feel that within 2 or 3 years the commercial product will approximate what according to the best opinion will be suitable for operation in all except special cases of government service. This is undoubtedly the best line of procedure, as it is not likely that a subsidy plan will be established in this country in connection with truck manufacture. Both the truck manufacturers and the government want to improve the current truck specifications.

### Trucks Severely Tested

It is agreed that the tests to which trucks have been subjected on or near the Mexican border are the most severe that have been had in any part of the world. The conditions of service have been abnormal in that the lines of communication have been maintained without the use of railroads. The performance of some of the trucks has been wonderfully good, but there is room for further beneficial specification in various respects. The necessary engineering study is now being made, many of the S. A. E. mem-

bers going to the Mexican border to view at first hand the unusual conditions of weather, sandy grit and alkali encountered.

The development of suitable tractor types of motor vehicle will also be given attention.

Regulations are being prepared for use in the organization of officers and enlisted men of the Reserve Corps recently authorized by Act of Congress. There will be a mobilization of the reserve organizations of a fortnight's duration each year. Reserve Corps officers will be appointed in sufficient number to make possible the assembly of troops at local points and transporting them to strategic points.

### For Transportation

Past-president Wilson of the American Automobile Assn. announces that over 90 per cent of the millions of American pleasure car owners would very willingly and quickly tender the use of their vehicles under any suitable plan of mobilization. This will make possible immediate transportation preparedness which would be wanted in case of emergency. It is stated reliably that in many districts large bodies of troops can be mobilized by motor cars before the railroads operating in the respective districts can get sufficient cars ready to transport them. Demonstrations which have been made readily show that troops can be moved by automobile faster than by train.

Suitable types of armored cars for use by the ordnance department as well as types meeting the needs of the engineers, the signal and the artillery corps will be developed.

Emphasis was again placed upon the vital importance of good roads. It was pointed out that \$225,000,000 was spent on good roads in this country last year and that in some of our territory we now have the best road systems in the world. Those in attendance at the meeting were:

Major Palmer E. Pierce, General Staff Corps.  
Lieut. Col. Chauncey B. Baker, Quartermaster Corps.  
Major L. P. Williamson, Medical Corps.  
Howard E. Coffin, Chairman Industrial Preparedness Committee, Naval Consulting Board.  
Bion J. Arnold, Chairman Transportation Committee, Naval Consulting Board.  
Alfred Reeves, Chairman Military Transport Committee, National Automobile Chamber of Commerce.  
George W. Dunham, Member Military Transport Committee, Society of Automobile Engineers.  
A. L. Riker, Member Transportation Committee, Naval Consulting Board.  
H. D. Church, Chairman Truck Standards Division of Standards Committee of the S. A. E.  
Wm. P. Kennedy, Member Military Transport Committee, S. A. E.  
John A. Wilson, Chairman Military Preparedness Committee, American Automobile Association.  
Amos G. Batchelder, Member Military Preparedness Committee, A. A. A.  
J. S. Marvin, Manager Traffic Department, N. A. C. C.  
W. H. Allen, Member Tire and Rim Division of S. A. E. Standards Committee.  
Coker F. Clarkson, Chairman Military Transport Committee, S. A. E.

## Gasoline Prices Down 1 Cent

### New Jersey, the Carolinas and Part of Ohio Affected—Crude Lower

NEW YORK CITY, Aug. 2—The price of gasoline has been reduced 1 cent a gallon in New Jersey, North and South Carolina, Virginia and at most of the filling stations in Cleveland, and the Standard Oil Co. has dropped the price 1 cent in the Cincinnati section. Gasoline is now selling for 22 cents in New Jersey; 23 cents in Cleveland; 24½ to 26½ cents in the Carolinas; 22½ to 24½ in Virginia.

### 3-Cent Reduction

A close investigation of petroleum market conditions discloses the fact that within the last year there has been an enormously increased production of crude oil not only in Oklahoma and other Western fields, but in such oil districts as Pennsylvania and Ohio, and that as a result of this the price of gasoline may drop from 1 to 3 cents under the present market price.

In Pennsylvania alone 60,000 old oil wells have been uncovered and reworked with satisfactory results. Wells producing 6 to 8 barrels of crude per day were not worth working when crude was selling at 40 cents per barrel, but when it rose to \$2.65 per barrel, as it did in Pennsylvania, such wells proved very profitable. In Ohio 25,000 old wells were reworked. In Oklahoma wells were sunk deeper and in other oil producing States similar conditions prevailed.

As a result, the market is not prepared to take care of this increased supply and storage facilities to care for 100,000,000 barrels of crude will soon be ready. This supply is practically equivalent to a 6 months' consumption of gasoline.

The greater use of the cracking process in gasoline refining as introduced by Doctor Burton of the Standard Oil Co. of Indiana, 5 years ago has made it possible to get practically double the quantity of gasoline from the crude.

The manufacture of gasoline from natural gas has greatly aided in relieving the situation, as the high price of gasoline made it possible to produce fuel from the gas by either the compressor or vacuum processes.

Further relief in the crude market is in sight due to the building of 50 tank steamers to be used in transporting crude from Mexico and the Gulf fields to the refineries.

Reductions in crude oil prices have been announced in the Mid-Continent, Ohio, Texas and Louisiana fields, falling from \$1.55 to \$1.25.



## Studebaker To Add 40,000 Ft.

### Extra Floor To Be Added To New Building—Plans Other Additions

DETROIT, MICH., July 27—The Studebaker Corp. has awarded contracts for construction work that will add 40,000 sq. ft. to the floorspace of the Studebaker factories. An extra floor, 50 by 300 ft., is to be added to one of the three-story buildings at present used as a warehouse for materials, so that the Studebaker plants may be better prepared to stock up on materials in advance of immediate needs.

A new one-story building to be used in connection with final assembly work is to be erected on the site purchased by the Studebaker company in May, adjoining plant No. 3 on the west side of Detroit. With the annexing of this property the total floorspace occupied by the Studebaker factories has been increased to 150 acres.

Authority to add ½ mile more of railroad siding has also been given, which will be in the nature of double railroad platforms, each one-fourth of a mile long.

The value of the construction work that has been authorized will run close to \$100,000.

### New Armleder Truck Prices

CINCINNATI, OHIO, July 29—Armleder trucks are now sold at a new scale of prices, as follows:

Model	Tons Capacity	Drive	Price
HC	2	Chain	\$2,200
EC	2½	Chain	2,350
HW	2	Worm	2,400
KW	3½	Worm	3,250

A new series of the 2-ton worm-driven model will be announced very shortly. This new series is designated HW-2, and will be similar to the old series except for minor refinements of detail.

### New Moreland Delivery Car

LOS ANGELES, CAL., July 25—The Moreland Motor Truck Co. has announced a new model, a light delivery truck, the chassis to sell at \$990. This new model is a 1500 lb. capacity rapid service utility truck equipped with Wisconsin motor, Timken axles and roller bearings, three-speed transmission, and with solid or pneumatic tires optional.

### Auto Body Co. Addition

LANSING, MICH., July 28—A further enlargement of the plant of the Auto Body Co. will occupy a large tract of land purchased adjacent to the factory,

where a three-story factory extension will be built. It will front 75 ft. on Turner Street and run back 200 ft. west of Turner. The company has also made an arrangement with the New York Central railroad for the installation of a direct freight siding with that railroad from its plant.

### Corman Is Denneem Sales Manager

CLEVELAND, OHIO, July 29—E. W. Corman has been appointed sales and advertising manager of the Denneem Motor Co., this city, maker of the Denmo truck. Mr. Corman left a similar position with the Elgin Motor Car Corp., Chicago, Ill., and was formerly with the Saxon Motor Car Co., Detroit, Mich.

### Prine a Pathfinder Representative

INDIANAPOLIS, IND., July 29—H. W. Prine has been appointed district sales representative for eastern Pennsylvania for the Pathfinder Co., this city. Mr. Prine will specialize on carrying out the company's educational work among its dealers. He will make his headquarters in Philadelphia.

### Devlin Joins Elgin Corp.

CHICAGO, ILL., July 29—F. X. Devlin has resigned as purchasing agent of the Federal Motor Truck Co., Detroit, Mich., to become identified with the Elgin Motor Car Corp., this city. Mr. Devlin has been connected with the Federal company since its formation 6 years ago.

### Hastings Is Empire Consulting Engineer

INDIANAPOLIS, IND., July 27—Don T. Hastings has recently moved to this city from Detroit to act in the capacity of consulting engineer to the Empire Automobile Co. Mr. Hastings was previously assistant chief engineer to the Hupp Motor Car Co.

### Smith to Manage Buda Motor Sales

HARVEY, ILL., July 29—L. R. Smith, Indianapolis representative of Eise-mann magnetos for several years, has resigned to become general sales manager for the motor department of the Buda Co., this city.

### Budd Starts Plant Addition

PHILADELPHIA, PA., July 29—The Edward G. Budd Mfg. Co., this city, is having a factory addition built at Twenty-fifth Street and Hunting Park Avenue for the making of automobile bodies.

### Kentucky Revivo Battery Petitions

LOUISVILLE, KY., July 29—Pursuant to a resolution adopted by the directors of the Kentucky Revivo Battery Co. Monday a voluntary petition in bankruptcy was filed for the concern July 25.

## U. S. Tests Armored Truck

### New Type Mounted on King Chassis Tried Out for Power and Speed

WASHINGTON, D. C., Aug. 1—An official test was conducted here to-day with the King chassis fitted with a new type of armored body. The tests were supervised by two members of the Marine corps and some army officers. The car was first given a hill-climbing test on a short steep hill on Thirty-fifth Street; it was then given another similar test on the road leading to Fort Myer; at Fort Myer it was driven through a prepared ravine through which water was flowing; lastly it was given a speed test at 30 m.p.h. at Fort Myer. The test continued from 2 o'clock until 5.

On Wednesday the car will be driven to Annapolis to be tested through 6 miles of sand and on Thursday it will be driven to Camp Biddle, Philadelphia, where it will be loaded on a transport and taken to sea. It will be out several days, during which landings will be made with the car intact and in five units.

### Scripps-Booth Corp. Organized Under N. Y. Laws

NEW YORK CITY, July 29—Announcement is made by C. H. Booth, president of the Scripps-Booth Co., of the organization under the laws of the State of New York of the Scripps-Booth Corp., with a capitalization of 70,000 shares, no par value, of which 25,000 shares are to be offered for public subscription at \$50 per share.

The Scripps-Booth Corp. is a consolidation of the Scripps-Booth Co., Detroit, and the Sterling Motor Co., also of Detroit.

The corporation will have no bonds or preferred stock and no floating debt.

Plant extensions are planned which will permit an output of 12,000 cars for 1917. The Sterling company has made the engines for Scripps-Booth cars since they were first built and now becomes a unit of the organization. The Scripps-Booth capital was increased from \$100,000 to \$350,000 early in the year following the entrance into the concern of Clarence H. Booth, who will head the new corporation.

### Truck Man Home from War

NEW YORK CITY, Aug. 2—Granville A. Pollock, who has represented the Pierce-Arrow Motor Car Co. at the war front in Flanders, France, during the past 18 months, arrived home last week. Mr. Pollock had charge of anti-aircraft trucks.

[illegible]



both payable Sept. 1 to stock of record Aug. 15. The payment of the same was the initial dividend of 3 months ago. It is reported that net earnings for the first 6 months of 1916 amounted to approximately \$300,000 or twice the amount required for dividends. The company's new factory for miscellaneous rubber business is nearly completed and operations will begin early in August.

#### Dividends Declared

B. F. Goodrich Co., quarterly of \$1.75 per share on preferred, payable Oct. 2 to holders of record Sept. 21. Also quarterly of \$1 a share on common, payable Nov. 15 to holders of record Nov. 3.

Lee Rubber & Tire Corp., quarterly of 50 cents a share and an extra of 25 cents per share, payable Sept. 1, 1916, to holders of record at the close of business Aug. 15, 1916.

#### Daniels Capital Now \$250,000

READING, PA., July 29—The Daniels Motor Car Co., this city, manufacturers of the Daniels eight, has increased its capital stock from \$100,000 to \$250,000.

#### Salisbury Wheel Doubles Capital

JAMESTOWN, N. Y., July 29—The Salisbury Wheel & Mfg. Co., this city, has increased its capital from \$500,000 to \$1,000,000.

#### Muskegon Foundry Grows

MUSKEGON, MICH., July 26—A three-story addition, 150 by 50 ft., will be erected by the Enterprise Foundry Co.

## Stock Prices Are Dull But Firm

### General Motors and Packard Show Gains, But List Is Inactive

NEW YORK CITY, Aug. 1—The automobile securities, both on the exchange and the curb, reflected the general tone of the entire list practically throughout the past week, although there were some brief fluctuations, the tendency as a rule being toward lower prices, although in almost every case recoveries took place, leaving the stocks in almost the same position as at the end of last week. The only issues to show material gains were General Motors, which picked up 20 points on the common and 5% on the preferred, and Packard common which gained 7 points. Other slight gains were 1½ points for J. I. Case, 1 point for International Motor common, and 1 point for Studebaker common.

Chevrolet headed the list of losers, having dropped 8 points, while Chandler declined 3½ and Willys-Overland common lost 2%. Ajax Rubber, Goodyear common and Springfield Body common each lost 2. There were several other minor losses, but a good share of the issues registered no change at the end of the week.

The Stromberg Carbureter issue was over-subscribed, and while the general attitude toward automobile and allied

securities was one of watchful waiting, as in the case of practically all the other stocks, there seemed to be no difficulty in disposing of these issues, although the volume of trading was small.

The characteristics of the New York market were naturally reflected in the quotations on the Detroit exchange, although no losses were shown by active stocks in Detroit, General Motors common gaining 20 and Maxwell common 4½, with Maxwell first preferred up 1½ points and the second preferred 1 point higher than last week's. Among the inactive stocks Kelsey Wheel registered a loss of 100 points.

### Lower Crude Features Markets

NEW YORK CITY, Aug. 1—The automobile materials market, like the securities quotations, showed very little change this week, the most important changes being a tendency to lower gasoline prices due to the drop of 10 cents a barrel in crude and advices from London to the effect that crude rubber prices were lower, manufacturers being indifferent to offerings and the same being true of sellers. This may reflect a decreased scarcity of rubber resulting in somewhat lower prices. Cottonseed oil was weak, closing 32 cents a barrel lower than last week, while rapeseed oil was 2 cents lower. Sulphuric acid lost 50 cents and lead was 15 cents cheaper per hundred pounds. The only increase in price noted was that of 1½ cents per pound and Ceylon first latex. All the other prices remain steady.

### Automobile Securities Quotations on the New York and Detroit Exchanges

	1915		1916		Wk's
	Bid	Asked	Bid	Asked	Ch'ge
Ajax Rubber Co. (new).....			62	66	-2
J. I. Case pfd.....	70	79	85	90	+1½
Chalmers Motor Co. com.....	90	92½	175	185	..
Chalmers Motor Co. pfd.....	96	97½	98	101	..
*Chandler Motor Car Co.....			104	106	-3½
Chevrolet Motor Co.....			208	212	-8
Fisk Rubber Co. com.....				160	..
Fisk Rubber Co. 1st pfd.....			114	126	..
Fisk Rubber Co. 2d pfd.....			120	..	..
Firestone Tire & Rub. Co. com.....	506	512	915	930	..
Firestone Tire & Rub. Co. pfd.....	109	111	111	115	..
*General Motors Co. com.....	177	179	500	524	+20
*General Motors Co. pfd.....	103	105	115½	116	+5½
*B. F. Goodrich com.....	51	53	72½	72¾	-1
*B. F. Goodrich pfd.....	103½	104½	113¼	114	+¼
Goodyear Tire & Rubber com.....	268	271	223	230	-2
Goodyear Tire & Rubber pfd.....	105	106½	105	108	-1
Grant Motor Car Co.....			9	11	..
Hupp Motor com.....			6½	7	..
Hupp Motor pfd.....			80	100	..
International Motor Co. com.....	15	17	6	9	+1
International Motor Co. pfd.....	37	42	18	25	-1
*Kelly-Springfield Tire & Rub. com.....			71¼	72	+1
*Kelly-Springfield Tire & Rub. 1st pfd.....	84½	87	95¼	97	+¾
Kelsey Wheel pfd.....			100½	100½	+¾
*Lee Rubber & Tire Corp.....			43½	44½	-1½
*Maxwell Motor Co. com.....	33	34½	81¼	81½	+½
*Maxwell Motor Co. 1st pfd.....	82	83	87	87½	+½
*Maxwell Motor Co. 2d pfd.....	29	31	57	57½	+¾
Miller Rubber Co. com.....	196	199	200	215	..
Miller Rubber Co. pfd.....	104	106	104	106	..
Packard Motor Car Co. com.....	110	115	175	185	+7
Packard Motor Car Co. pfd.....		100¼	100	104	..
Paige-Detroit Motor Car.....			44	47	-1
Peerless Truck & Motor Corp.....			22	24	-1
Perlman Rim Corp.....			113	116	..
Portage Rubber Co. com.....	36	37½	113	116	..
Portage Rubber Co. pfd.....	92	95	115	117	..
Regal Motor Co. pfd.....			17	21	..
Reo Motor Truck Co.....	17	18½	36¾	37¾	-½
Reo Motor Car Co.....	30¾	32	42	43	-1½
Saxon Motor Car Co.....			74	77	-1
Springfield Body com.....			75	80	-2
Springfield Body pfd.....			116	120	..
Standard Motor Co.....			5	6	..

	1915		1916		Wk's
	Bid	Asked	Bid	Asked	Ch'ge
Stewart-Warner Speed. com.....	63	64½	102	104	-1
Stewart-Warner Speed. pfd.....	105	107			..
Stromberg Motor.....			41½	41¾	-½
*Studebaker Corp. com.....	84	85	127½	127¾	+1
*Studebaker Corp. pfd.....	101	102½	109	111	..
Stutz Motor.....			64½	64½	+¾
Swinehart Tire & Rubber Co.....	88	92	85	87	..
United Motor Corp.....			67½	68½	-1½
*U. S. Rubber Co. com.....	45	46	52¼	53¼	-1¾
*U. S. Rubber Co. pfd.....	101¾	103	108½	108¾	+¾
White Motor Co. (new).....	103	108	53½	53¾	-¾
*Willys-Overland Co. com.....	134	135½	58½	58¾	-2¾
*Willys-Overland Co. pfd.....	103	105	105	106	-¾

### OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

#### ACTIVE STOCKS

Auto Body Co.....	..	90	36½	38½	..
Chalmers Motor Co. com.....	..	90	..	180	..
Chalmers Motor Co. pfd.....	95½	97½	..	103	..
Continental Motor Co. com.....	225	..	..	36½	..
Continental Motor Co. pfd.....	82	86	..	10½	..
Ford Motor Co. of Canada.....	1475	..	..	345	..
General Motors Co. com.....	176	181	490	540	+20
General Motors Co. pfd.....	104	106	112	116½	..
Maxwell Motor Co. com.....	32	35	80	82½	+4½
Maxwell Motor Co. 1st pfd.....	81½	84	85½	88½	+1½
Maxwell Motor Co. 2d pfd.....	29	31	56	59	+1
Packard Motor Car Co. com.....	110	115½	174	180	..
Packard Motor Car Co. pfd.....	..	100¼	102	104	..
Paige-Detroit Motor Car Co.....	..	..	44	50	..
W. K. Prudden Co.....	20¼	..	..	44¾	..
Reo Motor Car Co.....	32¼	33½	..	43¾	..
Reo Motor Truck Co.....	..	18	..	38	..
Studebaker Corp. com.....	83½	86	126	129	..
Studebaker Corp. pfd.....	100	103	105	..	..
C. M. Hall Lamp Co.....	..	..	..	31	..

#### INACTIVE STOCKS

Atlas Drop Forge Co.....	25½	..	..	40	..
Kelsey Wheel Co.....	205	..	350	..	-100
Regal Motor Car Co. pfd.....	..	21	17	..	..

\*At close July 31, 1916. Listed New York Stock Exchange. Quotations furnished by John Burnham & Co.

## Indianapolis Race Sept. 9

Date Advanced from Sept. 4  
Because of Conflict with  
Cincinnati Race Date

INDIANAPOLIS, IND., July 28—The local speedway officials have advanced the next racing date from Sept. 4 to Sept. 9 on account of the opening of the Cincinnati Speedway on that date. The Harvest Auto Racing Classic, as the event will be called, will be run in three races for cars known as non-stock and having piston displacement of 300 cu. in. or less. The races will be at 20, 50 and 100 miles.

The prize money will total \$12,000. In the 20-mile event first prize is \$400; second, \$300; third, \$200; fourth, \$100. Two thousand dollars will be the amount the drivers will struggle for in the 50-mile event and will be divided as follows: \$700 for first, \$500 for second, \$400 for third, \$300 for fourth, and \$100 for fifth. The 100-mile race, which may be run off as a championship event, permission having been asked the A. A. A. Contest Board, will be divided as follows: first, \$3,500; second, \$2,000; third, \$1,200; fourth, \$1,000; fifth, \$600; sixth \$400 and seventh \$300.

### 19 Entries for Tacoma

TACOMA, WASH., July 31—While there is still more than a week in which to make entries in the Montamarathon and Golden Potlatch trophy 300-mile race to be held on the Tacoma Speedway, Aug. 5, indications point to a field of more than 20 starters.

The following entrants had signed July 26:

DePalma .....	Mercedes
Henderson .....	Maxwell
Chandler .....	Crawford
Rawlings .....	West Duluth Special
Moore .....	Peusun
Barsby .....	Hudson Special
Milton .....	Duesenberg
Frauchi .....	Delage
Un-named .....	Gandy Special
DeAlene .....	Duesenberg
Rickenbacher .....	Maxwell
DeVigne .....	Delage
Lewis .....	Crawford
Sorenson .....	Morse
Taft .....	Omar
Johnson .....	Crawford
Un-named .....	Gandy Special
O'Donnell .....	Hoskins Special
Price .....	Gandy Special

### Marmon Breaks Record

(Continued from page 168)

The object of Mr. Stevens' trip was to demonstrate the value of good roads in quick military mobilization. Mr. Stevens is chairman of the Motor Reserve Division of the American Defense Society. The car was a Marmon stock model 34 roadster and is the privately-owned vehicle of Mr. Stevens, although the co-operation of the Nordyke & Marmon

organization was afforded the car and drivers across the country.

The speed at which the car traveled may be judged from the fact that although it left New York at 1.30 a. m., it had arrived in Buffalo at 2.50 p. m. on the same day, having covered the 450.4 miles at more than 33 m.p.h. average. The car was in South Bend at 4.10 a. m. the second day and arrived at Merrillville, its nearest point to Chicago, at 7 a. m. the second day, having covered the 993 miles by the northern route in 30 hr. and 30 min. The car arrived at Omaha at 1.10 a. m. on the third day, Cheyenne at 4.50 p. m. on the third day, Salt Lake City 7.40 p. m. on the fourth day, Reno 5.30 a. m. on the fifth day.

### Five Drivers

Five drivers divided the time, the greater part of the distance being driven by Mr. Stevens. The other drivers were Walter Bieling, Robert Creighton, Wm. Binz and Fred Barbour. The car was driven from New York to Syracuse by Mr. Barbour, from Syracuse to Cleveland by Mr. Stevens, Cleveland to Chicago by Mr. Binz, Chicago to Omaha by Mr. Stevens, Omaha to Cheyenne by Mr. Barbour, Cheyenne to Evanston by Mr. Stevens, Evanston to Ely by Mr. Bieling, Ely to Reno by Mr. Creighton and Reno to San Francisco by Mr. Stevens. A message was carried from Major-General Wood, commanding the Department of the East, to Major-General Murray, commanding the Department of the West.

Before the trip was started a schedule was laid out like that of a railroad timetable. This was closely adhered to until some difficulties of a mechanical nature and road irregularities were encountered toward the end of the trip. The car left Rawlins, Wyo., 35 min. behind schedule on account of muddy roads. The roads between Evanston and Salt Lake City were in bad condition and a wire from Salt Lake City reported that a torque rod socket had been broken in Parley's Canon, 16 miles from Salt Lake City. Repairs were soon made, however, and Bieling left with the car at 7.40 p. m. from Salt Lake City on July 27. Rain and washouts delayed the car just before entering Ely, and due to poor roads a broken wheel resulted along the same stretch. Due to the misguiding of a pilot 3 hr. were lost on the desert.

The trustees of the American Defense Society were keenly interested in the experiment and as chairman of the Motor Reserve Division Committee Mr. Stevens made the test directly under the auspices of this society. The drivers were under instruction not to exceed 50 m.p.h. at any time and the fact that the high average was maintained under these instructions gives a remarkable demonstration of regularity.

## Pathfinder High Gear Run Ends

Twelve Crosses Continent  
Sealed in High—Makes 60  
M.P.H. on Track

NEW YORK CITY, Aug. 1—The Pathfinder twin six which left San Diego, Cal., on July 3 to cross the continent on high gear arrived here to-day. The car was met by a delegation of Pathfinder owners and officials of the American Automobile Assn., being conducted to the Sheepshead Bay Speedway, where it was run over a measured course at 60 m.p.h. as a final demonstration.

The car was officially sealed in high gear by the A.A.A. through its representative, Al. G. Waddell of Los Angeles. The seals have been inspected frequently throughout the route by A.A.A. officials and officers of the Lincoln Highway, over which the car was operated throughout the entire distance. The mileage covered was 4921 at the completion of the mile test on the Speedway. After this it was taken to the New York agency and re-measured by officials to check up as a stock car.

### Speed No Object

No attempt was made to acquire a high speed average, as the average distance traveled daily was 200 miles and no night driving, to any extent, was done. Four days were spent at various points along the trip in idleness, so that altogether the trip occupied 28 days. The car is geared 5 to 1 on high, this being the standard ratio that is sent out with cars to hilly territories.

Walter Weidely, son of George Weidely, designer of the engine employed in the car, drove practically the entire distance. He was checked in and out of every town of consequence along the way by hotel keepers, chambers of commerce, etc. The worst point along the route was Lucky Boy Mountain, Nev., where it required strenuous efforts to pull the car over on high gear. Rain was encountered at Rock Springs and Laramie.

### 10.2 M. P. G. Fuel

A gasoline consumption of 10.2 miles to the gallon was averaged over the route. The car carried a driver, mechanic and a number of spare parts, including a clutch and extra live axles which were never used. Two of the tires, both on the left side, had California air in them when the car arrived at New York. The right tires were changed along the route. The highest price paid for gasoline along the route was at Fish Springs, Utah, where it was 65 cents.



(Continued from page 169)

aging sign, for it makes plain that such contracts are not being signed merely on momentary enthusiasm or because of a type of hysteria peculiar to gatherings of the kind. Generally, careful investigation precedes the making of contracts.

That the demonstration will stimulate sales there seems no doubt. Of late, owing to a long-continued drought and to partial failure of wheat and corn crops, implement dealers and automobile men handling tractors have assumed a condition of lethargy which has not augured well for sales. In fact, sales have fallen off quite noticeably since the first of the year and tractor manufacturers look to this demonstration to bolster up the courage of dealers and to inject new life into the trade.

#### Stimulating Sales

The absence of rain throughout Kansas is having somewhat of a double-barreled effect. In the first place it has retarded the corn crop to such an extent that dealers state that if no rain falls within a short time fully two-thirds of their accounts will have to go over until next Spring. And in the second place it has left the ground almost stony hard where uncultivated, and given tractor manufacturers the hardest kind of plowing to do. A supplementary effect, and an altogether important one, is that no one of the tractors has failed to make good in the demonstration. Thus, farmers and dealers who would be impressed by tractor plowing under ordinary conditions are doubly impressed by the good work being done under the present adverse conditions.

It is true that during the first day of plowing many more or less tortuous furrows were plowed and that in some cases it was necessary to have as many as three men on a gang of three plow bottoms in order to get the plows in and to keep them in. But notwithstanding, this is not held against the tractors but is rather taken as an indication of their ability; for it is realized that horseflesh *could not* plow under similar conditions—that is, without at least four horses to a bottom instead of the usual two.

#### Make Dynamometer Tests

This year, tractor manufacturers and those who view the demonstrations have a definite means of knowing exactly how much work a tractor must do to pull its plows. Each morning, before the plowing is started dynamometer tests are made to ascertain the average draft per plow bottom in various parts of the field. These figures, obtained with a hydrostatic dynamometer developed and operated by the Hyatt Roller Bearing Co., are then posted at the test furrow where they are obtained. Knowing the power of the tractor, which is displayed

## Tractors Make Hit in Kansas

on a sign carried by the machine, and the number of plow bottoms pulled, spectators can then refer to the test draft figures and make allowance, if necessary, for the condition of this part of the field. The average draft per bottom on Tuesday, the first day, was 710 lb. However, the draft varied widely over various parts of the field, some spots being almost stony hard and very dry and other parts being quite sticky.

The character of the soil is quite different from that in Texas and moldboard plows are used almost exclusively. It is admitted that better results might be obtained, at least insofar as the tractors are concerned, if disk plows were used, but Kansans are wedded to moldboards and they are used in the demonstration for this reason. In Texas it is almost impossible to use a moldboard because it will not scour, due to the sticky soil.

#### Value of Deep Plowing

Does Kansas need the tractor? Will the tractor prove a success in Kansas? These two questions are perhaps best answered by referring to the work done a year ago in the demonstration. But first let us examine conditions in Kansas up to about a month or two ago. There had been exceedingly heavy rains, so heavy in fact that in the great wheat belt the land was left soggy and entirely full of water. This naturally retarded the wheat. Subsequently there has been a month-long drought which has dried out that water very quickly and left the ground very hard. The net effect has been that whereas Kansas had

a banner year last year, getting an average of nearly 30 bu. of wheat to the acre, this year's average is expected to be between 6 and 9 bu. an acre.

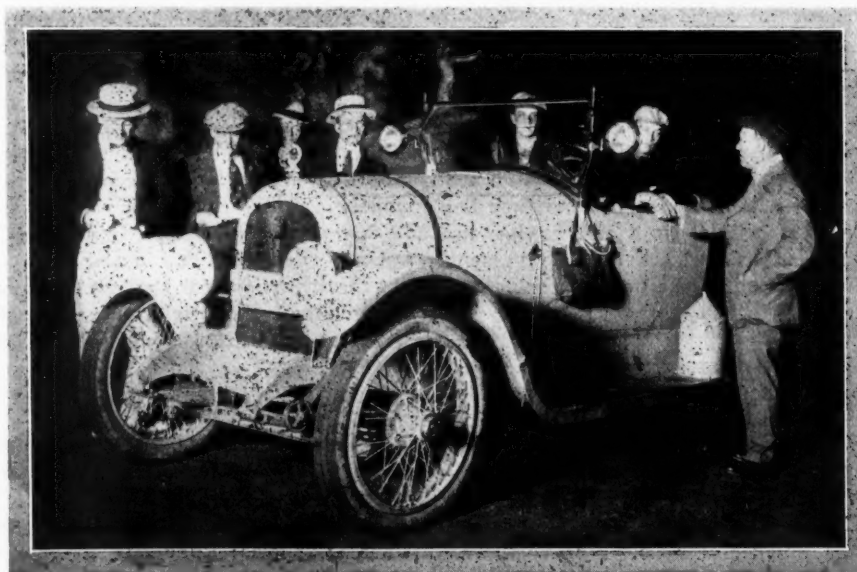
Now examine into what the tractors did last year.

The field that was plowed last year in the demonstration already has yielded an average of 24½ bu. of wheat to the acre as against the figure of 6 to 9 bu. for adjoining fields.

What better argument could be wanted for the genuine need of the tractor in Kansas? Why this great difference, you say? Briefly stated, the reason is deeper plowing made possible by the tractor.

The Kansas farms which this year are yielding only between 6 and 9 bu. of wheat per acre were plowed only between 5 and 6 in. deep last year. The demonstration field that has given a crop of 24½ bu. to the acre was plowed to a depth of 9 to 10 in.

In short this has proved a great object lesson on the benefits of deep plowing in Kansas. It has shown farmers and dealers that deep plowing not only provides for excessive rain by permitting the ground to soak it up, but that it provides equally as well for drought by permitting the ground to give up this stored moisture when it is needed. Not all land can be economically plowed as deep as this. Where there is a layer of clay beneath the top soil it may prove detrimental to throw this up over the good soil. For example, the United States Department of Agriculture experimental station in Texas has demonstrated that 7 in. is about the proper depth for Texas. This department has compiled figures on nearly every farmed area in the country and the figures are easily available. But they are not always as easily lived up to unless the



The record-breaking Marmon. Left to right—H. H. Wagner, Binghamton Motor Car Co.; A. G. Faulkner, Los Angeles agent; Dr. Brown, Philadelphia; Arthur Schaefer (former N. Y. Giant baseball player); J. W. Newman, mechanic; Fred Barbour, driver; and F. E. Moskovics, commercial manager Nordyke & Marmon Co.

plowing is done with a practical tractor.

This city has been admirably chosen as the scene of the Kansas demonstration. Reno county is virtually the center of the great Kansas wheat belt. Within a circle having a radius of 75 miles and having its center at Hutchinson there is grown fully 65 per cent of the Kansas wheat production and 42 per cent of its corn. Also, one-third of the population of the State is in this area.

Reno county itself last year averaged between 20 and 30 bu. of wheat to the acre but this year the average will fall below 9 bu. in the estimation of crop experts. Farther west in the State, however, conditions are more nearly normal. Corn has suffered to such an extent that the crop will be from one-third to one-half of last year's.

Kansas is one of the few States which have made a census of their farm tractor users, though the figures are not strictly accurate owing to the difficulty of getting returns and because of the constant influx of new machines. The census shows that Kansas had about 2500 tractors at the first of this year but that number may have increased to 3500 and in the estimation of quite a few probably has done so.

It is difficult to estimate, or even to guess, how many tractors Kansas will absorb this year. What with poor crops and poor tractor sales last year dealers are not inclined to be optimistic.

Gasoline is used here to a slightly greater extent than was the case in Texas. Strictly speaking, however, it is not gasoline, but is better styled naphtha. Gasoline here is defined as having a gravity higher than 58. Gasoline tractors, however, are burning fuel which measures about 57.3 Baumé. This fuel costs 18.3 cents per gallon. Kerosene measures about 44 and is selling this week for 7.3 cents.

### G. M. C.—121,113 Cars

(Continued from page 167)

being taken. Officers of the company say that the prospects for the new season are better than they ever were and they believe 1917 will show a similar big increase in business, as did the present year compared to the previous one.

#### Collins Elected to Board

NEW YORK CITY, July 28—At a meeting of the board of directors of the General Motors Co. yesterday R. H. Collins, Flint, Mich., was elected a director to fill the vacancy caused by the resignation of Thomas Neal of Detroit. Mr. Collins has been general sales manager of the Buick Motor Co. Mr. Neal, who was also a vice-president of the General Motors Co., withdrew because it is said he desires to give all his attention to the Signal-Commerce Motor Truck Co., of

which he became the active head when the Signal and Commerce companies were merged.

There have been quite a number of changes on the board of directors of the General Motors Co. during the past few months. At the present time the members of the board are the following: F. L. Belin, J. H. McClement, W. C. Durant, J. S. Haskell, L. G. Kaufman, Charles S. Sabin and A. H. Wiggin, New York City; Pierre S. du Pont and J. J. Raskob, Wilmington, Del.; W. L. Day and F. W. Warner, Pontiac, Mich.; W. C. Leland, Detroit; A. G. Bishop, W. P. Chrysler, R. H. Collins, C. S. Mott and C. W. Nash, Flint, Mich.

### Ford Prices Cut 18%

(Continued from page 167)

April, 1913. At the present time the facilities permit of a daily output of 2000.

In 1912 the prices of the Ford cars were \$600 for the touring car and \$525 for the roadster. These were reduced to \$550 for the touring and \$500 for the roadster on Aug. 1, 1913. On the first of August, 1914, the Ford company announced another cut in prices and the touring car was brought down to \$490 and the roadster to \$440. In addition it was promised that should the company sell 300,000 cars before Aug. 1, 1915, a profit-sharing rebate would be given to each purchaser. As this production was more than reached, the Ford company paid out over \$15,000,000 in rebates to car buyers, or \$50 per car. In June of 1914, a big cut on Ford parts was made, prices for these being lowered from 10 to 25 per cent.

Starting with Aug. 1, 1915, the prices of Fords were cut another \$50 per car, bringing the touring model to \$440 and the roadster to \$390. These prices have prevailed up to the present time and will be changed when the new announcement takes effect on Aug. 1. There was a mid-year reduction on Ford closed cars in November, 1915, which materially lowered the prices on some of these models. The sedan, which was formerly \$975, was cut to \$740. This price has again been lowered and is now \$645. To put the reductions for the last four years in a nutshell, the touring car which was priced at \$600 in 1912 will sell for \$360 for 1916.

#### Canadian Ford Prices Lower

FORD, ONT., July 31—The Ford Motor Co. of Canada, Ltd., has reduced the price on its 1917 cars from \$5 to \$35. The new prices which go into effect Aug. 1 are as follows: Runabout \$475 instead of \$480; touring car, \$495 instead of \$530; coupelet, \$695 instead of \$730. The town car and the sedan will sell respectively at \$780 and \$890 as during

the present season. The price of the chassis alone will be \$450. Officials of the company say that the fiscal year ending to-day has been much better than they had anticipated. For the season 1917 the output is expected to be about 60,000 cars, or at least 20,000 more than were built and sold during the fiscal year 1916.

#### Elgin Capital Now \$3,500,000

CHICAGO, ILL., Aug. 2—The Elgin Motor Car Corp., this city, has increased its capital from \$1,000,000 to \$3,500,000. This is in line with the concern's policy of expansion. The Elgin corporation recently took over the New Era Motor Car Co., Joliet, Ill.

#### Victor Rubber Capital \$750,000

SPRINGFIELD, OHIO, July 28—At a recent meeting of the board of directors of the Victor Rubber Co., this city, it was voted to increase the capital stock of the company from \$300,000 to \$750,000 in order to provide facilities to double the production of pneumatic tires.

A 100 per cent stock dividend on the common stock was declared, this having been made possible by the company's earnings last year.

#### Caples Goes to Overland

TOLEDO, OHIO, July 29—R. C. Caples has resigned as general traffic manager of the Western Maryland Railway to become associated in a confidential position with John N. Willys, president of the Willys-Overland Co., this city.

#### Pullman Dealers in Convention

YORK, PA., July 29—Wholesale and retail dealers of the Pullman Motor Car Co., from this country and abroad to the number of 125 assembled here this week to attend the annual dealers' convention July 27, 28 and 29. Prospects for 1917 were discussed and the new Pullman models were thoroughly examined. Special entertainment features were provided by the Pullman Motor Car Co. and the York Motor Car Co. H. W. Hayden, Pullman general manager, presided at the business sessions.

#### Swinehart Recalled to Republic Plant

YOUNGSTOWN, OHIO, July 29—B. C. Swinehart, for the past 3 years manager of the Philadelphia branch of the Republic Rubber Co., has been recalled to the main factory of the Republic company at Youngstown, where he will take charge of the solid tire sales.

H. D. Worthington, assistant manager of the Philadelphia branch, succeeds Mr. Swinehart as manager.



# Factory Miscellany

**New Building for Lee Tire**—The Lee Tire & Rubber Co., Conshohocken, Pa., has placed a contract for another building at its Conshohocken plant.

On the general floor of this building will be installed the necessary large dipping tanks used in the manufacture of rubber gloves, etc., the object being to take this part of the industry out of the main plant and provide considerable additional space for the manufacture of tires. By the erection of a separate building somewhat removed from the others the serious fire menace caused by the gasoline-laden atmosphere around the dipping tanks will no longer threaten more than the contents of this one structure.

The building measures 80 by 120 ft. in plan and will for the present contain but two stories. The foundations and reinforced concrete columns on the first floor are designed, however, for several additional stories.

**To Concentrate on Accessories**—The Peters & Heron Dash Co., Columbus, Ohio, engaged in the manufacture of dashes and other vehicle parts, has sold its dash business to the McKinnon Dash Co. of Buffalo and Troy, Ohio, for the purpose of devoting its entire attention to the manufacture of dimmers, robes, top covers and other accessories.

**Bowser Mutual Benefit Assn. Formed**—The S. F. Bowser Oil Tank & Pump

Works of Fort Wayne, which some time ago promised its employees \$10,000 to start a mutual benefit association when the plans for the organization had been made by the employees, made good its promise in a most substantial way when 10,000 silver dollars were turned over to the treasurer of the newly-organized Bowser Mutual Benefit Assn. The plan is \$40 per month will be paid a member unable to work on account of illness or accident; survivors of an employee who dies will receive \$125 for burial expenses and \$25 per month for 3 years; old age pension will be \$30 per month.

**Jackson - Church - Wilcox Adds**—The Jackson-Church-Wilcox Co., Saginaw, Mich., manufacturer of the Jacox steering gear, has announced an addition to its plant on North Hamilton Street, work on which will begin at once.

The new addition, which will be of brick, one-story, and 120 by 208 ft., will practically double the output of the concern. Eight hundred men will be given employment in the enlarged plant, which in its entirety will cover nearly two city blocks. With the proposed addition the next year's production of the company is expected to reach the half-million mark.

**Sparks-Withington Doubles Capacity**—Additions to the plants of the Sparks-Withington Co., Jackson, Mich., maker of the Sparton horn, are well under

way and when completed will practically double the size and production possibilities of the big factory. Paralleling the older plant, the new factory is 70 by 334 ft.; half being two stories and the rest one story. It is to be made of white brick and steel, and will be modern in every way. Much of the additional space will be devoted to radiator manufacture, it is stated. At present the factory is behind in its orders, though working 24 hr. a day.

**Electric Storage Battery Adds**—The Electric Storage Battery Co., Philadelphia, Pa., has bought forty-four dwellings near Nineteenth Street and Allegheny Avenue. The main office and plant are on the south side of Allegheny Avenue and Nineteenth Street. It is understood that several large additions to the company's plant will be built in the near future on the property acquired.

**Robinson Machine Buys Ground**—The Robinson Machine Co., Ecorse, Mich., has purchased a piece of ground west of Mill Street, where a factory will be erected to manufacture its new Truckford, for converting a Ford car into a 1-ton truck. Fifty men will be employed.

**Ford Service in Yonkers**—The Ford Motor Co., Detroit, Mich., will build a \$100,000 service plant at South Broadway, Herriot and New Main Streets, Yonkers, N. Y. The structure will be used as a distribution center.

## The Automobile Calendar

### ASSOCIATIONS

- Aug. 15—Metropolitan Section, S. A. E. Meeting at Automobile Club of America. Subject, "South America."
- Aug. 28-Sept. 1—Milwaukee, Wis., Booster Tour of Milwaukee Automobile Dealers.
- Sept.—Indianapolis. Convention for Formation of Indiana Automobile Trade Assn., under auspices of N. A. T. A., Hotel Claypool.
- Oct. 2-5—St. Louis, Fall Meeting Assn. of Automobile Accessory Jobbers.
- Dec. 2-9—Electricians' Country-wide Celebration.

### CONTESTS

- Aug. 5—Tacoma Speedway Race, Tacoma Speedway Association.
- Aug. 11-12—Pikes Peak, Col., Hill Climb, Pikes Peak Auto Highway Co.
- Aug. 12—Portland, Ore., Track Race, Hiller-Riegel Co.
- Aug. 18-19—Elgin Road Race, Chicago Auto Club.
- Aug. 26—Kalamazoo, Mich., 100-Mile Track Race.
- Sept. 1-2—New York, N. Y., Sheephead Bay Speedway, 24-Hour Race, Trade Racing Assn.

- Sept. 4—Elmira, N. Y., Track Race, Elmira Auto and Motorcycle Racing Assn.
- Sept. 4—Cincinnati, Ohio, Speedway, Cincinnati Speedway Co.
- Sept. 4—Newark, N. J., Track Race, Olympic Park, Racing Assn.
- Sept. 4—Des Moines Speedway Invitation Race. Limited to six entries.
- Sept. 4-5—Spokane, Wash., Track Race, Inland Auto Assn.
- Sept. 9—Indianapolis Speedway Race.
- Sept. 16—Providence Speedway Race.
- Sept. 18—North Yakima, Wash., Track Race, Washington State Fair.
- Sept. 29—Trenton, N. J., Interstate Fair, H. P. Murphy, Racing Sec.
- Sept. 30—New York City, Sheephead Bay Speedway Race.
- Oct. 7—Philadelphia Speedway Race.
- Oct. 7—Omaha Speedway Race.
- Oct. 14—Chicago Speedway Race.
- Oct. 19—Indianapolis, Ind., Race, Indianapolis Motor Speedway.

- Oct. 21—Kalamazoo, Mich., Track Races, Kalamazoo, Motor Speedway.
- Oct. 22-23—Los Angeles, Cal., Commercial Car Reliability Tour.
- Nov. 16 and 18—Santa Monica, Cal., Vanderbilt Cup and Grand Prix Races.

### GOOD ROADS

- Sept. 6-7—St. Paul, Minn., Good Roads Congress, Auditorium.

### SHOWS

- Aug. 2-9—Hollywood and West End, N. J., Show, Atlantic Exhibition Co.
- Sept. 2-9—Cleveland, Ohio, Show, Industrial Exposition and Fair, Edgewater Park.
- Sept. 2-9—Columbus, Ohio, Fall Show, Ohio State Fair, Columbus Automobile Show Co.
- Sept. 4-8—Hartford, Conn., Show, Connecticut Fair Assn.
- Sept. 4-11—Indianapolis, Ind., Show, Indiana State Fair, Indianapolis Automobile Trade Assn.
- Sept. 10-16—Milwaukee, Wis., Show, Wisconsin State Fair, Machinery Bldg.
- Oct. 14-31—Dallas, Texas, Show, State Fair.

- Jan. 6-13, 1917—New York City, Show, Grand Central Palace, National Automobile Chamber of Commerce.
- Jan. 13-20—Montreal, Que., Show, Montreal Automobile Trade Assn.
- Jan. 27-Feb. 3, 1917—Chicago, Ill., Show, Coliseum, National Automobile Chamber of Commerce.
- Feb.—Newark, N. J., Show, First Regiment Armory.
- Feb.—St. Louis, Mo., Show, Auto Manufacturers and Dealers' Assn.

### TRACTOR

- July 24-28—Hutchinson, Kan., Tractor Demonstration.
- July 31-Aug. 4—St. Louis, Mo., Tractor Demonstration.
- Aug. 7-11—Fremont, Neb., Tractor Demonstration.
- Aug. 14-18—Cedar Rapids, Iowa, Tractor Demonstration.
- Aug. 21-25—Bloomington, Ill., Tractor Demonstration.
- Aug. 28-Sept. 1—Indiana Tractor Demonstration.
- Sept. 4-8—Madison, Wis., Tractor Demonstration.
- Sept. 11-16—Milwaukee, Wis., Fall Show, Wisconsin State Fair, Milwaukee Automobile Dealers.

# The Week in the Industry



**Wisconsin News Items**—E. A. Hatfield, for 5 years assistant secretary and director of sales of the Bain Wagon Co., Kenosha, has resigned to become the leading spirit in the organization of the Mississippi Valley Motor Car Co., with headquarters in St. Louis. The company will act as distributor of Oakland cars in the Mississippi Valley, the territory including the states of Louisiana, Mississippi, Arkansas, southern Illinois, eastern Missouri, western Kentucky, Tennessee and some other tributary territory. Associated with Mr. Hatfield in the project is F. W. A. Vesper, St. Louis, who has been Buick distributor in St. Louis and vicinity for some time.

The University Supply Co., 468 Jefferson Street, Milwaukee, Wis., has been appointed distributor of Hardman tires. H. B. Gehring is general manager.

It is reported on excellent authority that the Overland Wisconsin Co., Milwaukee, owned by George W. Browne, and state distributor of Overland and Willys-Knight cars, will soon establish a large branch house and service station for the benefit of the northern Wisconsin territory, at Wausau, Wis. The company has taken an option on a site, 60 by 120 ft., at First and McIndoe Streets, Wausau, and proposes to erect a 4-story building of that size. The investment will be about \$50,000. It is stated that W. R. Stelling, Fort Atkinson, Wis., will have charge as branch manager.

The Auto Service & Supply Co., Milwaukee, specializing in Vesta batteries, has moved to new and larger quarters at 207 Fourth Street. Carl Aken has taken a financial interest and is vice-president and secretary of the concern.

The Marion Sales Co., Milwaukee, representing the Marion in Wisconsin, has granted the Stutz Motor Car Co. of Milwaukee the right to retail Marion cars in the city of Milwaukee and environs.

The Diener-Nelson Co., 188 Eighth Street, Milwaukee, distributor of the Haynes and Grant Six, has taken possession of its new quarters in the Hippodrome building, 612-623 Wells Street.

The Auto Service & Supply Co., 207 Fourth Street, Milwaukee, announces that Carl Aken, Jr., has been placed in charge of its storage battery service department. Mr. Aken has had several years of experience with storage batteries and formerly conducted the Aken Battery Co., Milwaukee, representing the Gould battery. The Auto Service & Supply Co. is distributor in a large ter-

## Trade Happenings

ritory of Vesta batteries and other products.

The J. H. Ryan Motor Truck Co., Madison, Wis., state agent of the Diamond T truck, has established a branch salesroom and service station at 495 Broadway, Milwaukee. The entire state territory will actually be handled from the new Milwaukee branch, and J. H. Ryan has moved from Madison to Milwaukee to take personal charge.

The Western Motor Supply Co., 408 Jefferson Street, Milwaukee, wholesaler, jobber and retailer of supplies and accessories and Quaker tires, has added a storage battery department, in charge of Charles Warner. The new department will make a feature of U. S. L. batteries and systems. Mr. Warner has specialized in electric storage battery work for more than 6 years.

**Philadelphia Items**—E. W. Burnshaw, Jr., recently in charge of the wholesale department of the Girard Automobile Co., 2314 Chestnut Street, distributor for Peerless cars and trucks, has been promoted to general manager of the company.

W. P. Herbert, Chandler dealer at Broad and Race Streets, has incorporated the business with the addition of W. G. Herbert and R. W. Cook. Mr. Herbert is president; Mr. Cook, vice-president and general manager, and W. G. Herbert, secretary and treasurer.

**Mountain Trade**—The Automobile Sales Corp., Denver, Studebaker and Franklin distributor for Colorado and Wyoming, has moved from 1509 Cheyenne Place to 1520 Broadway.

The C-B Auto Service Co., Denver, has opened a Moore distributing agency for Colorado at 1439 Cleveland Place.

The Maines-Hough Motor Co., Denver, Chevrolet, Monroe and Mitchell distributors for Colorado and Wyoming, with sales and service station at 439 Broadway, has given up the Mitchell and is handling the other two lines exclusively.

J. M. Scoville, Fort Morgan, Col., has secured the Chalmers agency for Morgan County.

The Denver Tire Service, Inc., Denver, United States tire distributor for Colorado and Wyoming, with salesroom and service station at 215-217 Sixteenth Street, is now managed by J. A. Payment, formerly manager of the Quick Service Tire Co., distributor of Quaker tires.

The George H. Estabrook Auto Co., Denver, Briscoe and Hollier distributor for Colorado and Wyoming, has secured the McGraw tire distributing agency for the same territory. The general salesroom is located at 1646 Broadway.

The Chamberlain-Woods Motor Sales Co., Denver, the new firm name of the Hupp Motor Sales Co., Hupmobile and Locomobile distributor for Colorado and Wyoming, has added the Dort distributing agency for the same territory.

F. P. Van Sickle, Denver, has opened a Colorado, Wyoming and Utah distributing agency for the Aurora demountable truck at 1608 Broadway.

Willys-Overland, Inc., Denver Branch, Denver, is the name of a factory sales and service branch just opened at Fifteenth Street and Cheyenne Place to handle the Rocky Mountain territory. The new concern will be managed by C. C. Eib, formerly general manager for J. W. Leavitt & Co., San Francisco, Overland and Willys-Knight distributor for the entire Pacific coast. The new branch will supply all of Colorado and part of Wyoming, Utah, Idaho and New Mexico.

H. G. Wimbush, Denver, formerly vice-president of the Motor Sales Co., a Ford time-payment concern, has secured the Mitchell distributing agency for Colorado and Wyoming and opened a salesroom in the new Fisk Building, Broadway and East Twelfth Avenue.

The Colorado Motor Car Co., Denver, Col., Saxon and Reo distributor for Colorado and Wyoming, has given up the Cole and Saxon and is arranging to move the Reo headquarters from 1520 Broadway into another location.

The J. S. Morrison Auto Co., Denver, Oakland distributor for Colorado and Wyoming, has taken on the Allen distributing agency for the same territory. The salesroom is at 1528 Broadway.

The Mid-West Auto Sales Co., Denver, King and Wichita truck distributor for Colorado and Wyoming, has given up the King and secured the distributing agency for the same territory for the Paterson light six and the Ross eight, and the Colorado territory for the Twin Bed trailer.

The Quick Service Tire Co., Denver, local agency for Quaker tires, which was formerly managed by J. A. Payment, is now handled directly by the Boss Rubber Co., 1548 Broadway, which has added the Quaker to its Kelly-Springfield tire distribution for Colorado, Wyoming and New Mexico.